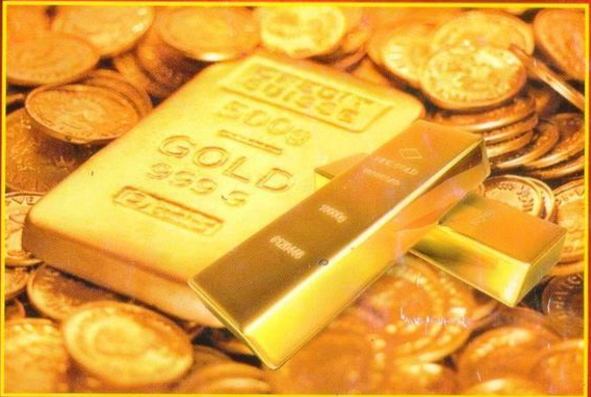
MANORAMA

TELL ME WHY

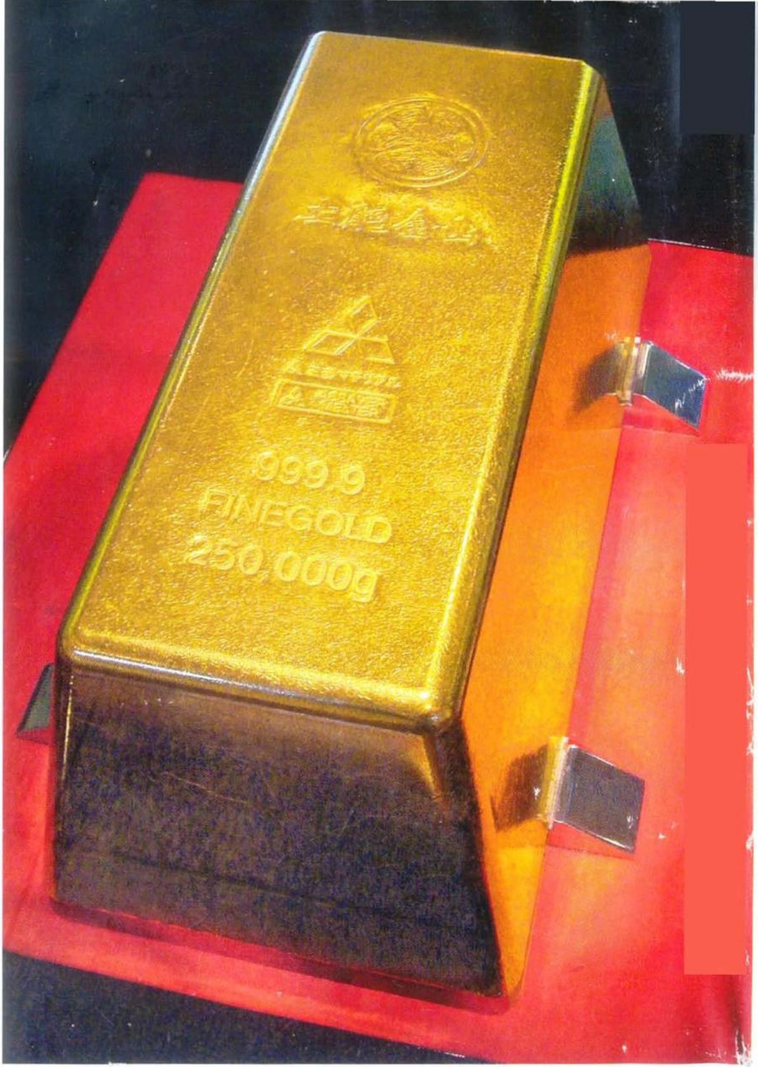
No:77



GOLD

& OTHER PRECIOUS METALS

100 + FACTS ABOUT METALS THAT RULE

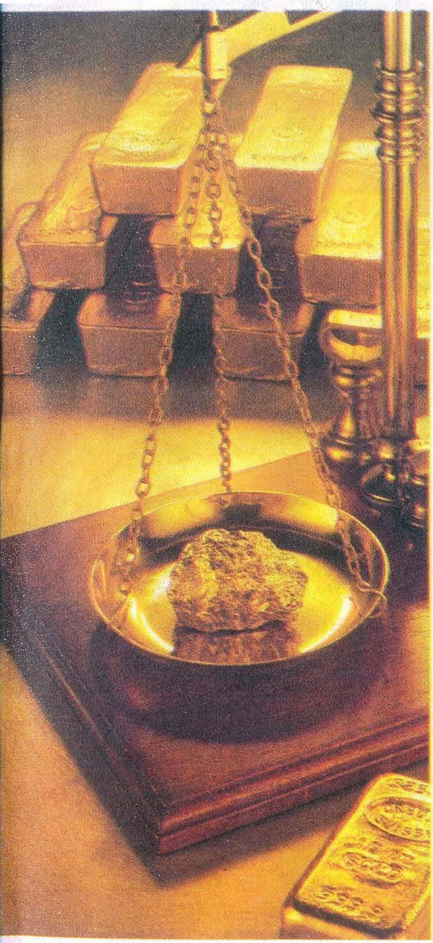


The Largest Gold Bar

The world's largest gold bar, at the Toi Gold Museum, Japan. The bar weighs 250 kg, and was manufactured by Mitsubishi Materials Corporation.

MANORAMA
TELL ME WHY
February 2013 . Volume: 7 . No: 2

From the house of MAGIC POT, THE WEEK,
MANORAMA YEAR BOOK, VANITHA
& THE MALAYALA MANORAMA DAILY



GORGEOUS GOLD

Gold has always been a magic word, throughout the history of mankind. With its pleasing glitter and surprising malleability, this precious metal has influenced the life of Man in all its aspects. This metal, with its Midas touch, has transformed history, science, literature and every other sphere of human activity. For instance, the search for gold changed the course of history, through explorations, conquests, and settlements. Efforts to find an easy way to 'make gold' out of cheaper metals developed into a pseudo-science named Alchemy, and this, ultimately led to the birth of an invaluable branch of scientific knowledge - Chemistry. This issue of Tell Me Why traces the fascinating story of gold and other precious metals.

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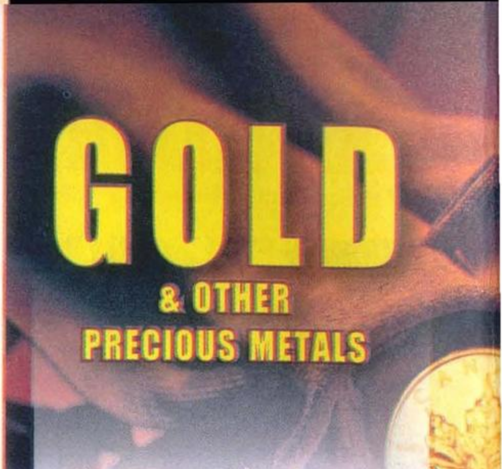


GOLD
& OTHER PRECIOUS METALS

Why are precious metals so valuable?

A metal is considered to be precious if it is rare. If new sources of the metal are found, or improvements in mining and processing make it more accessible, its value may drop. The demand for the metal also determines how valuable it is. Precious metals in bulk form are known as bullion, and they are important as investments. Bullion is made into ingots or coins, and people buy and sell them in bulk. The value of bullion is determined by its purity, and how efficiently it can be exchanged for money.

I am making this metal precious.

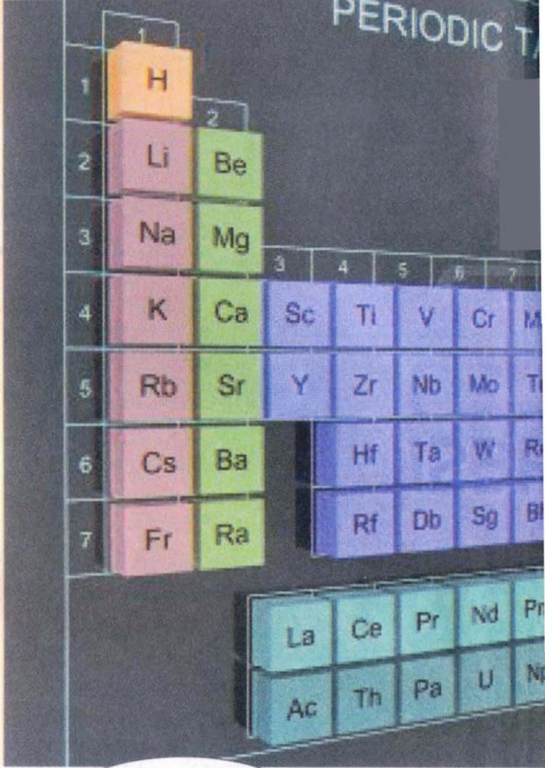
What are precious metals?

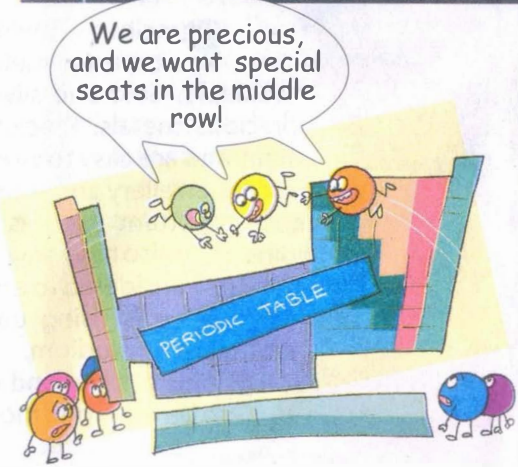
Precious metals are naturally occurring metals that are rare and valuable. Gold and silver are the best known precious metals. Precious metals have a high shine, and are easy to work with. They are used for making jewellery and other objects of art, but their most important use has been for the making of coins. They also have several industrial uses. Today, they are considered to an excellent investment as their value is rising day by day. Ruthenium, osmium, rhodium, iridium, palladium, platinum, silver and gold are considered to be the eight most precious metals in the world.

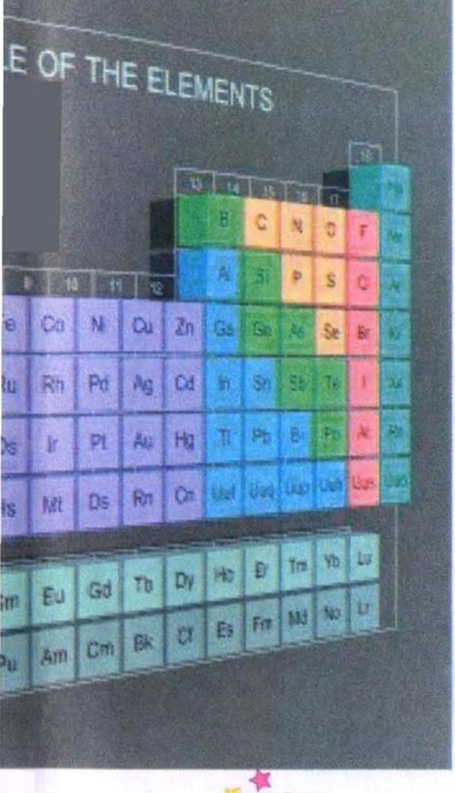
Where do we find precious metals in the periodic table?

The periodic table is a table that brings order to information about the chemical elements. It has rows and columns, and they each mean something different. When a column goes from top to bottom, it's called a group. The elements in a group have the same number of electrons in their outer orbital. There are more than 100 elements, and they are arranged in the periodic table in specific locations because of the way they look and act.

Precious metals form a big block of elements in the middle of the table. Ruthenium and osmium come in the 8th group, rhodium and iridium are in the 9th group, pallidium and platinum in the 10th and gold and silver are in the 11th group.

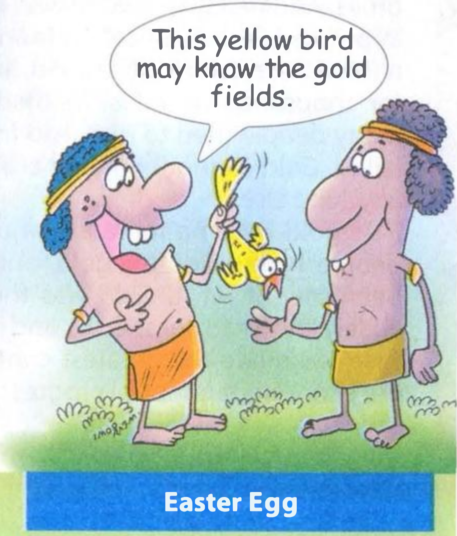



We are precious, and we want special seats in the middle row!
PERIODIC TABLE



What is gold?

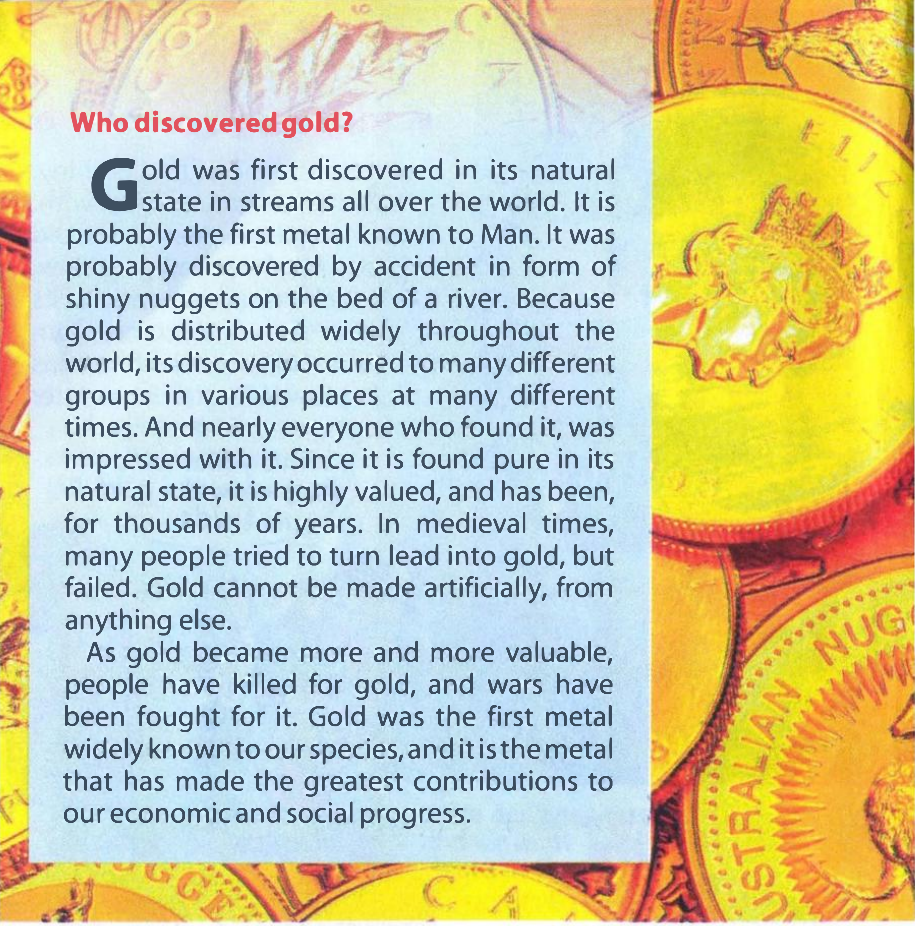
Gold is a metal that is shiny, soft, and easy to work with. The name gold comes from an old English word meaning yellow. Gold is a chemical element, and its symbol is 'Au' which comes from the Latin 'aurum', which means 'shining dawn'. Its atomic number


This yellow bird may know the gold fields.

STAR FACT

Easter Egg

In 1885, the Tsar of Russia had an imperial Easter egg made by Carl Faberge. The egg was in pure gold, and decorated with precious stones. It was a gift from the Tsar to his wife- and marked the beginning of a tradition that lasted till 1917.



Who discovered gold?

Gold was first discovered in its natural state in streams all over the world. It is probably the first metal known to Man. It was probably discovered by accident in form of shiny nuggets on the bed of a river. Because gold is distributed widely throughout the world, its discovery occurred to many different groups in various places at many different times. And nearly everyone who found it, was impressed with it. Since it is found pure in its natural state, it is highly valued, and has been, for thousands of years. In medieval times, many people tried to turn lead into gold, but failed. Gold cannot be made artificially, from anything else.

As gold became more and more valuable, people have killed for gold, and wars have been fought for it. Gold was the first metal widely known to our species, and it is the metal that has made the greatest contributions to our economic and social progress.

is 79. Gold is found as nuggets or grains in rocks, in veins and in alluvial deposits. Sometimes, it is found in minerals as gold compounds, usually with tellurium. It is a soft metal, and is usually alloyed to give it more strength. Gold is easy to work with, and can be hammered into thin sheets, It is a good conductor of heat and electricity, and is unaffected by air and most reagents. This means that gold never rusts, corrodes, or tarnishes.

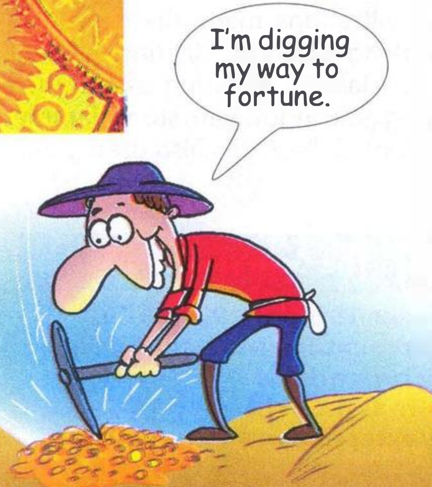
Why is the history of gold fascinating?

Early civilizations equated gold with gods and rulers. Gold, beauty, and power have always gone together. Gold in ancient times was made into religious shrines and idols, plates, cups, and vessels of all kinds, and of course, jewellery for personal adornment.

The Ancient Egyptians believed that the skin of their gods was golden, and Egypt's gold-producing regions at the time, made it into a wealthy nation. By 325 BC, the Greeks had mined for gold from Gibraltar to Asia Minor.

The Romans developed the technology of mining to new levels of sophistication.

In the Middle Ages, Venice introduced gold coins- the gold 'ducat', which became the most popular coin in the world for the next 500 years. In 1511, King Ferdinand of Spain launched expeditions to search for gold in the newly discovered Americas. In 1700, gold was discovered in Brazil. In the 19th century, gold mining moved onto the fast track, with the 1848 California Gold Rush. South Africa became a major source of the world's gold after 1869, and the Yukon Gold Rush followed in 1896.


I'm digging my way to fortune.

Mankind has gone to great lengths, and great risks, to discover, and own gold.

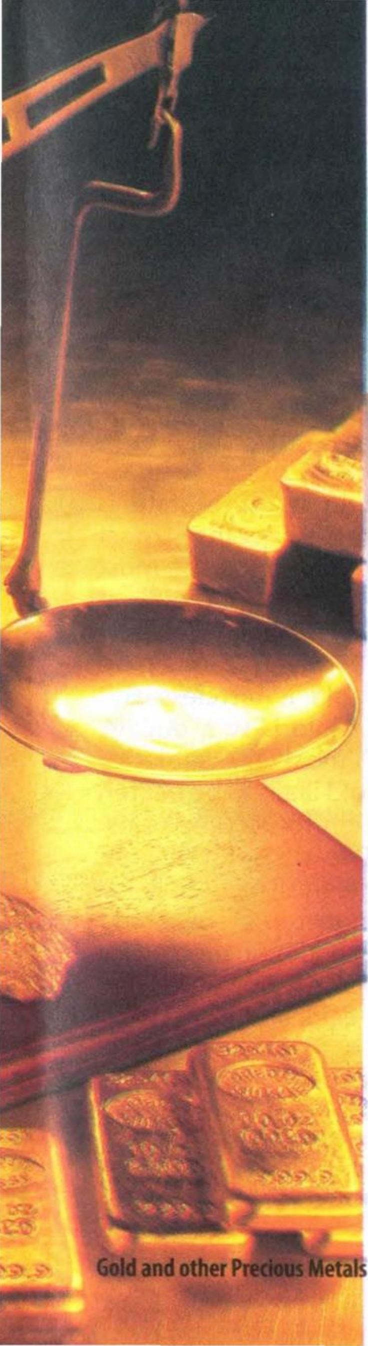
What were the uses of gold in ancient times?

Gold is very easy to work with. Since it occurs in its pure state naturally, it does not require any processing. Because of its beauty and brilliance, ancient cultures linked gold to the gods and kings. Artisans of ancient civilizations used gold lavishly in decorating tombs and temples. In time, gold not only retained its sacred quality, but became a symbol of wealth and social rank. By 1500 BC, gold had become the recognized medium of exchange for international trade.

South American civilizations made great headway with gold metal working between 900 and 1100 AD. Their goldsmiths specialized in using sheet metal created by hammering gold ingots with stone hammers on stone anvils. Ancient civilizations also used gold as money.

The Gold Standard

Between 1870 and 1900, all the major countries in the world linked their currencies to gold. This is known as the Gold Standard. The only exception was China.



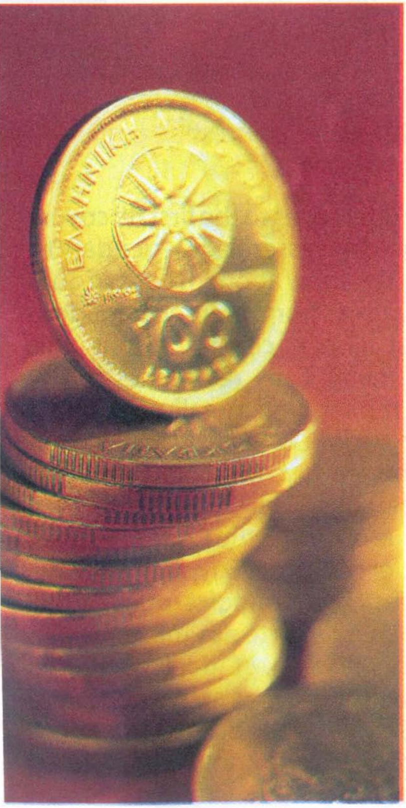
Hurry up, take gold from this hole.

What evidence is there that gold was used in ancient times?

Early references to the first discovery of gold are essentially legendary or mythical. We know about the use of gold in ancient times from references made in the great Greek classics about this precious metal. Early references to the geology, mining, and metallurgy of gold appear in ancient Egyptian codes, and in pictograms and inscriptions in the tombs of the pharaohs. There is also reference to the value of gold in the Code of Menes, the founder of the first Egyptian dynasty. The most ancient geological map known is the famous 'La carte des mines d'or' in the Turin Museum. It depicts a gold mining region that was active about the time of Seti I – around 1320 BC. References to gold and gold mining are numerous in Hebrews Old Testament.

Old Gold Jewellery

One of the earliest pieces of gold jewellery discovered is a burial headdress of lapis and carnelian beads with a willow leaf-shaped gold pendant. It is believed to have been crafted in 2600 BC, by goldsmiths in Mesopotamia.



What are the characteristics of gold?

Gold in its pure state is considered the most beautiful, and hence, the most valuable of the pure metals. It is metallic, having a yellow colour. High quality pure metallic gold is tasteless and scentless. Gold is soft, ductile, and the most malleable of metals. Gold leaf can be beaten thin enough to become transparent. The transmitted light appears greenish blue. Gold is a good conductor of heat and electricity, and is unaffected by air, nitric, hydrochloric, or sulphuric acid, and most other reagents.

Gold readily creates alloys with many other metals. In addition, gold is very dense, with a cubic metre weighing 19,300 kg.

Where is gold found?

There are two categories for gold found in nature. The first is primary, and the other is secondary. Primary gold is often what is found in rock formations, which ultimately become mines. It is highly likely that this gold will be found alongside other valuable minerals, like quartz and silver.

Secondary gold is found in small waterways that have run through rock and mineral formations. When the current is strong enough in streams, rivers, and creeks, the water will carry pieces of gold, often referred to as small nuggets or flakes, downstream.

Gold can be found on nearly every continent on Earth. South Africa has the largest concentration of gold, with the town of Johannesburg being built over the world's largest gold deposit. India is home to the world's second deepest underground gold mine, the Champion Reef Mine, which is located on the Kolar region of India. However, the Kolar gold fields have been closed for several years. With deposits of gold being found in the United States, Canada and Mexico, the North American continent is developing as a gold producing continent.

Sir, keep this in safe custody. This rock's interior is pure gold!
GOLD LOAN

What are the main sources of gold on Earth?

Most of the gold present today in the Earth's crust and mantle is the result of the impact of asteroids that occurred in the distant past. Gold is mostly found in the ores of rocks that were formed millions of years ago. It is found in a free form, as well as compound form, known as alloys, with silver, quartz, lead, tellurium, copper, zinc, and calcite. Gold is most often found as an alloy with silver, and very rarely as an alloy with mercury. Free gold occurs as very small to microscopic particles embedded in rock, often together with quartz or other minerals. These are called lode deposits. It is also found in the form of free flakes, grains, or larger nuggets that have been eroded from rocks, and end up in alluvial deposits called placer deposits. In recent times, it has been suggested that microbes can cause gold deposits by transporting grains of gold to form nuggets.

Can we get some gold?

Why is the ocean considered to be a rich source of gold?

Significant quantities of gold have been mined from ocean beach placers, and mid-oceanic ridges have yielded rich gold ore samples, but the greatest reserve of gold is the ocean itself. Seawater contains vast quantities of dissolved gold, though in dilute concentrations. The English chemist, S. Sonstadt, was the first to definitely establish its presence in 1872. However, precise measurements of its concentration are highly controversial. Owing to gold's extreme dilution, many factors make it difficult to accurately determine the concentration. This extremely dilute concentration of gold in sea water makes it difficult to mine the gold. It is just not economical. There is also gold in, and on the seafloor.

However, the gold deposits are one and a half to three kilometres under water. And once you reach the ocean floor, you'll find that gold deposits are also encased in rock that must be mined through. This is not easy either. If only we could find a way to economically extract gold from the ocean, there's enough of it so that each person on Earth could have nine pounds of the precious metal!

Why are alchemists associated with gold?

In the Middle Ages, an alchemist was a person who practiced a form of chemistry. His objective was to discover a substance called the philosophers' stone. This elusive material was thought to transform common metals such as lead, into silver or gold.

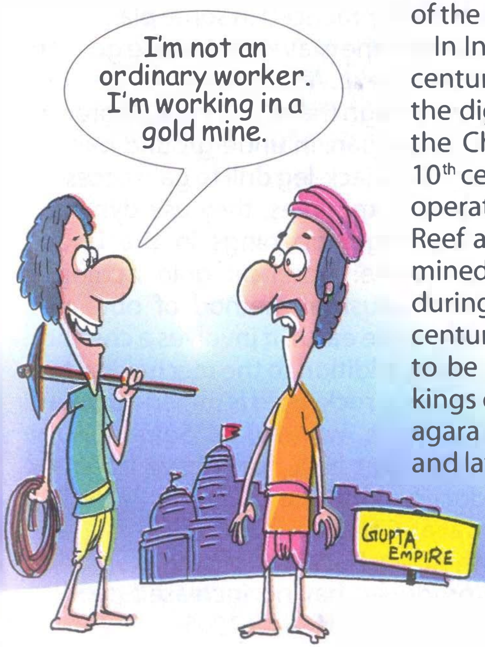
The alchemists believed that gold represented the perfection of matter, and that its presence in the body would enliven, rejuvenate, and cure a multitude of problems in the body. In Ancient Rome, gold ointments were used for the treatment of skin lesions and ulcers . The great alchemist and founder of modern medicine, Paracelsus, developed many highly successful treatments from metallic minerals, including gold. Alchemists mixed powdered gold into drinks to give relief to aching joints and today, it is widely used in the treatment of rheumatoid arthritis. While alchemists never succeeded in turning lead into gold, they did make discoveries that helped to shape modern chemistry.

Change this lime stone into a philosopher's stone.

What do you know about gold mining in ancient times?

Gold was among the first metals to be mined, because it commonly occurs in its native form – this means that it is not combined with other elements. The history of gold mining therefore, coincides with the history of civilization itself. Ancient Egypt and Nubia were major ancient hubs of mining for gold. The history of gold mining becomes even more interesting with the technological advances of the Romans.

In India, prior to the 2nd and 3rd century AD, gold was mined by the digging of small pits. During the Chola period in the 9th and 10th century AD, the scale of these operations grew. The Champion Reef at the Kolar gold fields was mined to a depth of 50 metres during the Gupta period in the 5th century AD. The metal continued to be mined by the 11th century kings of South India, the Vijayanagara Empire, from 1336 to 1560, and later, by Tipu Sultan, the king of Mysore state – and even later by the British. During the Medieval Period, gold was mined extensively in Hungary as well.


I'm not an ordinary worker. I'm working in a gold mine.
GUPTA EMPIRE

Golden Temple

King Solomon, a Jewish King in ancient times built a famous golden temple. The entire temple, both inside and outside, including its floors and doors, were overlaid with gold. Phoenician craftsmen were employed to build the temple. Its construction began in the fourth year of Solomon's reign, and took seven years.

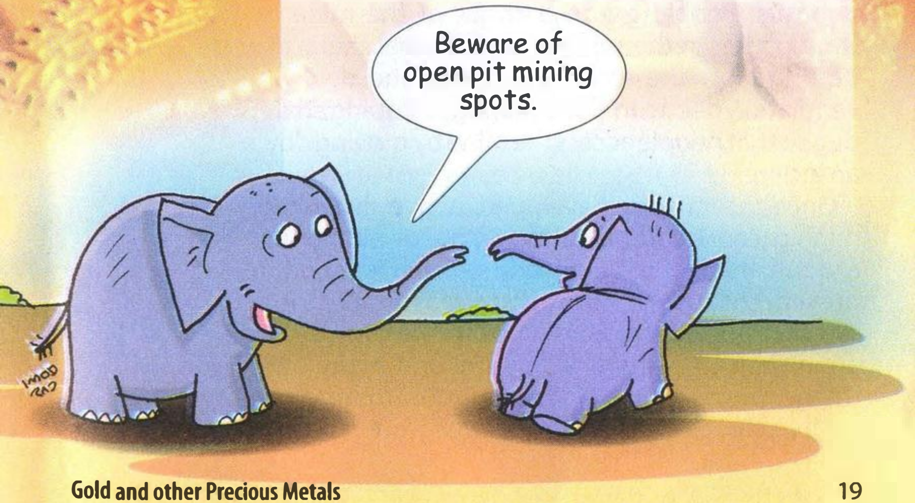
What do we know about gold mining today?

Gold is mined in different ways today. One simple method is panning, which is still practiced in some places. The miners pass the gravel containing gold ore through a sieve. After the gravel and mud passes through the holes, the gold present is left in the pan. In underground mining, miners use a jack-leg drill to gain access to the gold. Sometimes, they use dynamite to blast larger openings in the underground mine. Open pit gold mining is another industrial method of obtaining gold from the earth. It involves a chemical process in addition to the mechanical task of removing rock. Gold is mined in around 90 countries worldwide. Some of the countries, that historically have been top producers continue to be so, including Australia, Canada, the USA, Russia and South Africa. But China is now the world's top producer, having increased productivity significantly since 2005.

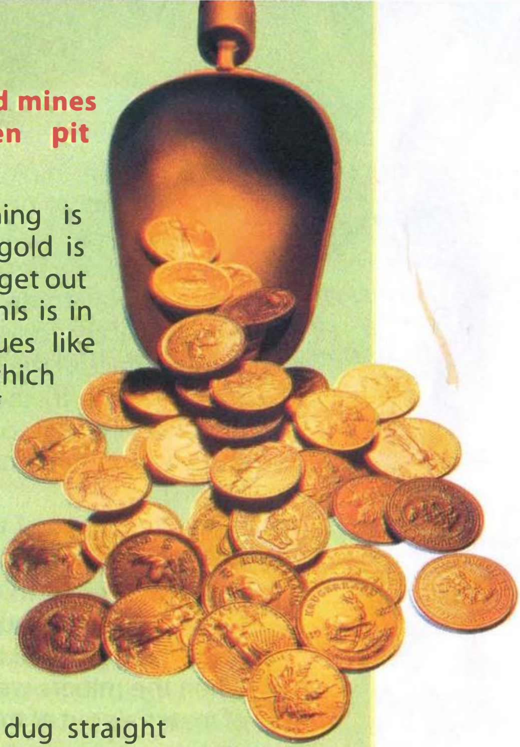
What are open pit mines?

Open-pit mining is a kind of surface mining. Mining companies choose this way to get rocks and minerals out of the ground, because it is the easiest and cheapest way to do it. Open-pit mining is only used if the rocks or minerals are close to the surface of the land. Even before they start to mine it, the scientists know the value of the rock or minerals below the surface, and how much it will cost to dig them up.

The top layers of the land are removed. After that, layer after layer is taken away, until the rock or mineral is visible. This is taken out, processed when it's needed, and sold. Explosives like dynamite are used when the miners want to get large blocks of materials out of the Earth.


Beware of open pit mining spots.

Why are underground mines different from open pit mines?



Underground mining is done when the gold is too far underground to get out with surface mining. This is in contrast with techniques like open pit mining, in which the surface layers of ground are scooped away. The first step in underground mining is development mining, in which shafts are dug into the site to make the gold accessible. There are two ways this can be done. In the first, a shaft is dug straight down into the Earth to access buried deposits. People get in and out of the mine through lifts in the shaft, and additional shafts may be dug to create emergency exits, and deal with ventilation needs. In slope mining, a sloping shaft is dug so that people access the mine by moving down an incline.

Once the mine is developed, active production mining can begin. One major need with underground mining is ventilation. Proper support to prevent collapses is also important, as are electricity, safety systems including alarms for workers, evacuation shafts, emergency lighting, and many other things. The deepest gold mines, in South Africa, are located some five kilometres under ground.

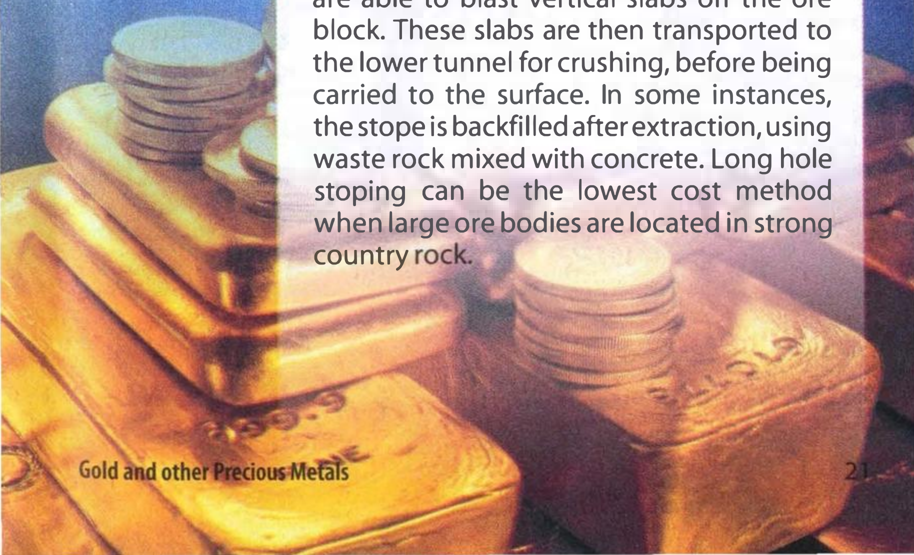
STAR FACT

First Gold Currency

Pure gold coins were first minted by King Croesus of Lydia -modern day western Turkey-in the 6th century BC. These coins were renowned for their purity, and were used internationally for trade in ancient times.

What is long hole stoping in gold mining?

Stoping is the removal of a wanted ore from an underground mine, leaving behind an open space known as a stope. Long hole stoping is a method of mining used when geologists discover large strong blocks of ore- in this case, gold- in the surrounding rock. Using a series of vertical and horizontal tunnels and holes, miners are able to blast vertical slabs off the ore block. These slabs are then transported to the lower tunnel for crushing, before being carried to the surface. In some instances, the stope is backfilled after extraction, using waste rock mixed with concrete. Long hole stoping can be the lowest cost method when large ore bodies are located in strong country rock.



CURIOUS FACT

Golden Mask

The funeral mask of King Tutankhamun is made of 10.8 kilos of solid gold, inlaid with coloured glass and semiprecious stone. The royal headdress has upon the forehead, a vulture and a cobra. The vulture is a symbol of kingship, and the cobra,of protection. The stripes of the headdress are made of blue coloured glass the shade of lapis lazuli. It is one of the most famous and widely recognized artefacts in the entire world.

When is the cut and fill method of mining used?

In cut-and-fill mining, the ore is removed in a series of horizontal drifting slices. When each slice is removed, the void is filled, generally with waste material, and the next slice of ore is mined. In overhandcut-and-fillmining, mining starts at the lower level, and works upward. In underhand cut-and-fill mining, work progresses from the top downward. Cut and fill mining is expensive, but it is very useful when the surrounding rock is too weak to use long hole stoping.

We can use the cut and fill mining method on this apple.

What is panning?

Panning is one of the earliest forms of mining. The process basically consists of placing the material that you want to process into your pan, and shaking it in a left to right motion underwater to cause the gold, which is heavy, to work its way down toward the bottom of your pan. At the same time, the lighter materials, which are worthless, are worked up to the surface of the gold pan, where they can be swept away. The process of shaking and sweeping is repeated, until only the heaviest of materials are left-namely the gold, and heaviest black sand. Today, however, it is much more commercialized, as gold deposits are washed out of hillsides by powerful hydraulic jets. Or the deposits may be dredged up from the bottom of lakes.

Rocker Box

A rocker box is a high walled box used to trap gold. The rocking motion of the box makes the water move so that the heavier material like gold can be trapped. The rocker box is also called a cradle.

AMAZING

By-Product

Gold is also a by-product when some other metals are mined. For example, when copper is mined, gold is also obtained as a by-product. In fact, the largest producing gold mine in the world, the Grasberg Mine in Papua, Indonesia, is actually a copper mine.

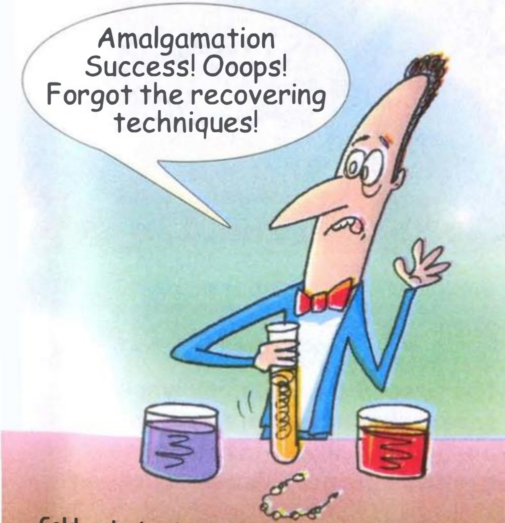
What is dredging?

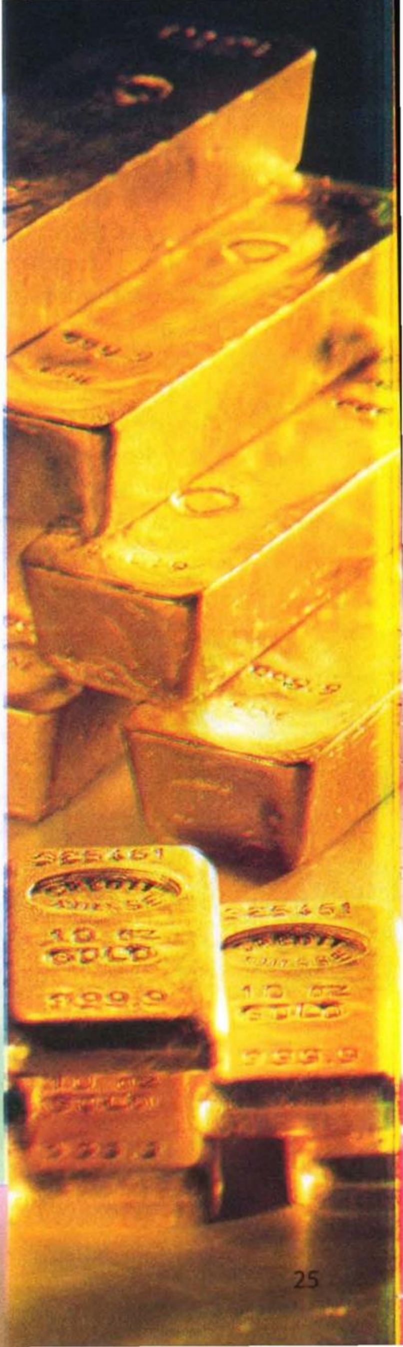
Another method for recovering gold is dredging. Dredgers are small machines that float on water. A suction dredger has a suction hose which is controlled by a miner working underwater.

Small dredgers are more common than large ones, though some large suction dredges are used for commercial production throughout the world, especially in New Zealand's South Island, and the Klondike region of Canada. The advantages of this type of mining is that it is low cost, does not harm the vegetation or environment, and the water is recycled. However, care must be taken to ensure that dredging operations do not clash with the spawning periods of the fish population.

Why is the amalgamation technique useful in gold extraction?

When gold particles are mixed in alluvial deposits, or is mixed up with crushed ore, they can be recovered by a technique called amalgamation. The crushed ore or alluvial deposits are washed over slightly inclined copper plates coated with mercury. The gold forms an alloy with mercury, and forms a coating that is scraped off from time to time. This alloy is then distilled in an iron retort, and the gold is recovered in its pure form again. However, the particles of gold have to be relatively coarse for this technique to be effective.


Amalgamation Success! Ooops! Forgot the recovering techniques!



What is Hard Rock Mining?

When gold is encased in rock, and not found loose or in sediment, it can be extracted only by a technique known as hard rock mining. Before hard rock mining operations have even begun, companies explore areas where gold may be found and scientifically analyse the rock.

The actual gold originates deep within the Earth in places called pockets. First, miners dig a tunnel into the solid rock. They often risk their health, digging with picks and shovels during long shifts in these dark, damp tunnels, building the shafts, and carting out the ore. The miners raise the ore out of the mine in wheeled carts pushed on rails, and take it down to the mill. Here, rock fragments are sorted according to size. Larger ore

The Great Bullion Famine

The Great Bullion Famine was a severe shortage of precious metals - particularly silver - in fifteenth-century Europe. This was caused by

fragments are pulverized, or crushed in the crusher.

The fine ore is further crushed to a consistency of fine sand or talcum powder. This powder is fed into a thickener to create a sticky substance known as sludge. The liquid sludge is diverted into a holding tank, and later processed, so that gold is recovered from it. The gold recovered from the ore through the milling process is poured into bricks that are shipped to be assayed.

Lost a coin somewhere here.

the fact that mining and gold production declined sharply throughout Europe during this time. This shortage led to the Age of Discovery, when European nations sent expeditions in search of new sources of gold and silver.

What is cyanidation?

Cyanidation is a method of extracting mined gold from its ore. Water is added to the milled ore to create slurry. The slurry is then mixed with cyanide, which bonds easily with the gold to form a solution, thus separating the gold from the rock. Zinc powder is then added to the mixture. Cyanide bonds even more readily with zinc than with gold, and this makes it possible for the gold to be filtered out. Solutions containing cyanide have to be carefully managed to prevent the formation of cyanide gas, which is highly toxic.

CURIOUS FACT

First Gold Nanoparticles

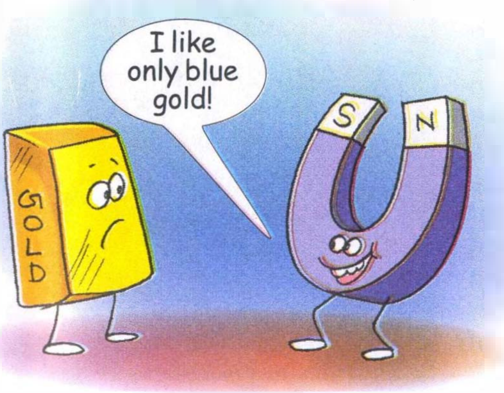
Nanoparticles are small clusters of atoms about 1 to 100 nanometres long. 'Nano' derives from the Greek word 'nanos', which means dwarf, or extremely small. It is used as a prefix of any unit to denote a billionth of that unit. The Ancient Romans melted gold powder into glass, and this diffused the gold nanoparticles.

Hallmarking

Hallmarking is a system guaranteeing the quality of a precious metal. In the case of gold, gold articles are evaluated and tested at an official assaying and hallmarking centre. They are then certified as conforming to the national and international standard of fineness and purity.

What do we know about gold refining?

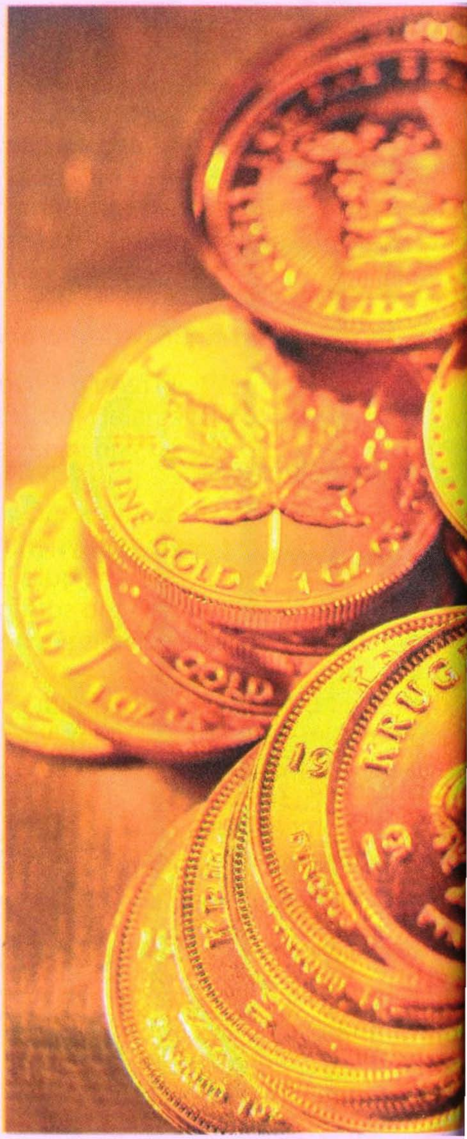
Gold refining involves removing impurities that remain after the smelting process. Workers add borax and soda ash to the molten metal, which separates the pure gold from other precious, and less precious metals. A sample is then taken to a lab for tests, or assays, that measure the gold content. In most cases, the gold is 99.9 percent pure. Pure gold is generally too soft for most practical applications, so other metals are nearly always added to it. When gold is combined in this way, it forms an alloy. Scientists and goldsmiths often use colours to designate the various gold alloys that are possible. For example, white gold is made by combining gold with nickel, silver or palladium. Red gold is an alloy of gold and copper. And blue gold is the result of mixing gold with iron. The purity of gold is referred to as its fineness. The totally pure metal is 1000 fine.


I like only blue gold!
GOLD
S
N

What is the colour of gold?

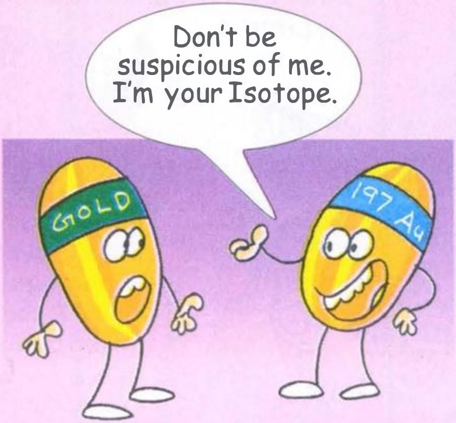
Most pure metals are grey or silvery white. Pure gold however, is yellow. Pure gold is generally too soft to be used for jewellery anyway, so other metals are nearly always added to it, and the colour of gold changes according to the metal added. For example, nickel can be mixed with gold to create white gold, and palladium is another metal used to create white gold alloys.

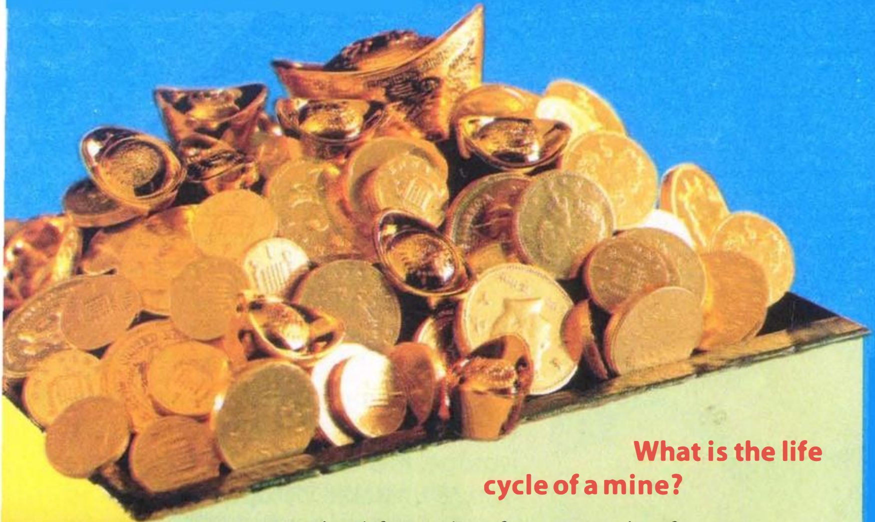
When copper is added to gold, you get pink and rose tones, and greenish shades can be created by adding silver to gold. When indium or gallium is added to gold, a blue colour can result. Though gold is available in several different colours, the most popular is yellow gold, followed by white gold and rose gold. Other gold colours that are also available are bronze, red and lime gold. Whatever the colour, the purity of gold remains unaffected.



What are the main isotopes of gold?

An isotope is an element in a different form. It will have the same number of protons as the original element, but a different number of neutrons. Some elements have several isotopes, while others may have only one isotope. Naturally occurring gold has only one stable isotope. It is called Au-197. There are also 36 unstable isotopes of gold, and most of these have a half life of less than a few minutes. The half life is the amount of time it takes for half of the atoms in a sample to decay. The isotope of gold with the longest half life is Au-195, with a half life of 186 days. Four other isotopes of gold have a half life longer than a day. The half life for a given isotope is always the same.


Don't be suspicious of me. I'm your Isotope.
GOLD
197 Au



What is the life cycle of a mine?

In the life cycle of a mine, the first stage is exploration. If a deposit is found that is economical to mine, then a development plan is drawn up. Once the development plan is approved, the actual construction of the mine starts. When the construction is over, operations begin. Gold is extracted, and shipped for refining or smelting. Once all the ore has been extracted, the disturbed land is reclaimed, so that the environment is protected.

UK Gold Standard

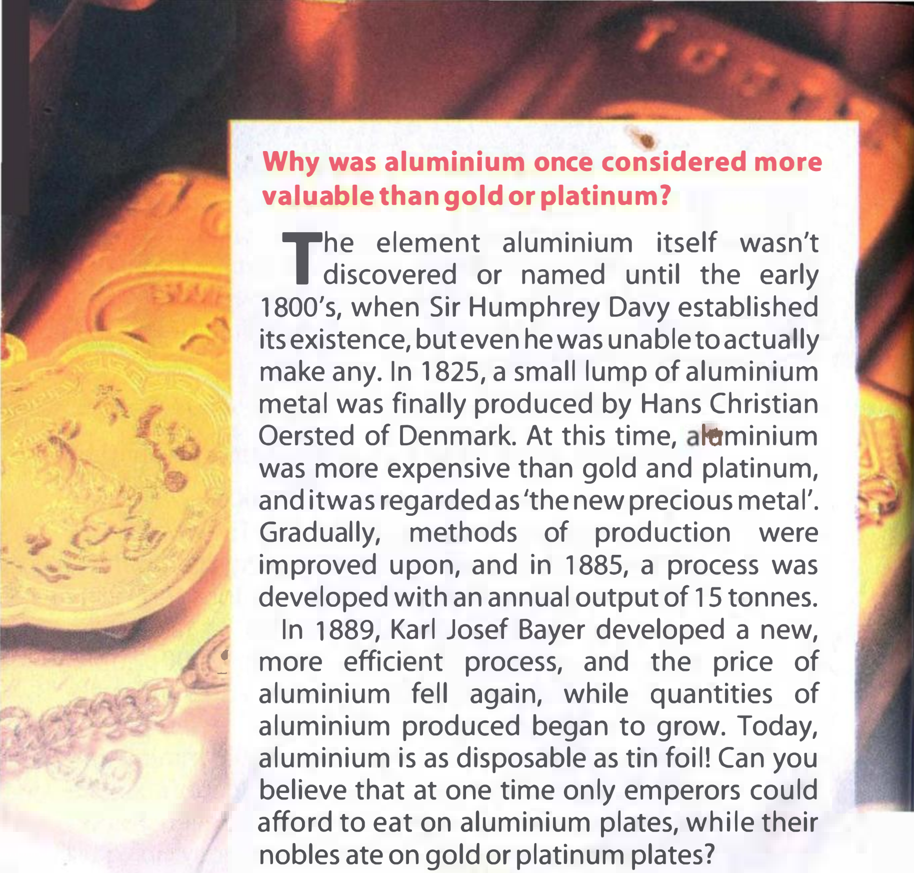
The gold standard is an economic policy under which currency is backed by a reserve supply of gold. Britain was the first country to adopt the system when in 1717, the British Government linked currency to gold at a fixed rate. All countries in the world have now abandoned the Gold Standard.

Gold Plating

Gold plating is a method of depositing a thin layer of gold onto the surface of another metal. This can be done by a process known as electroplating. The first experiment in electroplating was carried out by Professor Luigi Brugnatelli at the University of Pavia, Italy.

How many people work in gold mines worldwide?

It is estimated that around 250,000 people are employed directly in gold mining. They work in 23 of the world's leading gold mining companies. However, the numbers who work in jobs indirectly connected to gold mining must also be taken into account. For example, in South Africa, 150,000 people, are employed directly in gold mines, and almost the same number- another 150,000 are employed indirectly in industries connected to gold mining and providing services to it. In some countries like Tanzania, those employed indirectly are even greater in number than those working directly in gold mining.

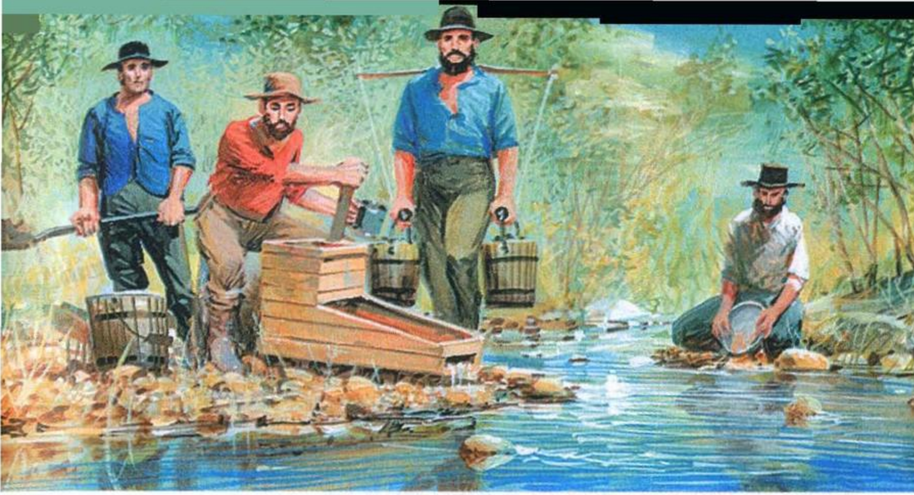


Why was aluminium once considered more valuable than gold or platinum?

The element aluminium itself wasn't discovered or named until the early 1800's, when Sir Humphrey Davy established its existence, but even he was unable to actually make any. In 1825, a small lump of aluminium metal was finally produced by Hans Christian Oersted of Denmark. At this time, aluminium was more expensive than gold and platinum, and it was regarded as 'the new precious metal'. Gradually, methods of production were improved upon, and in 1885, a process was developed with an annual output of 15 tonnes.

In 1889, Karl Josef Bayer developed a new, more efficient process, and the price of aluminium fell again, while quantities of aluminium produced began to grow. Today, aluminium is as disposable as tin foil! Can you believe that at one time only emperors could afford to eat on aluminium plates, while their nobles ate on gold or platinum plates?

Once I was considered more precious than you!
ALUMINIUM
GOLD



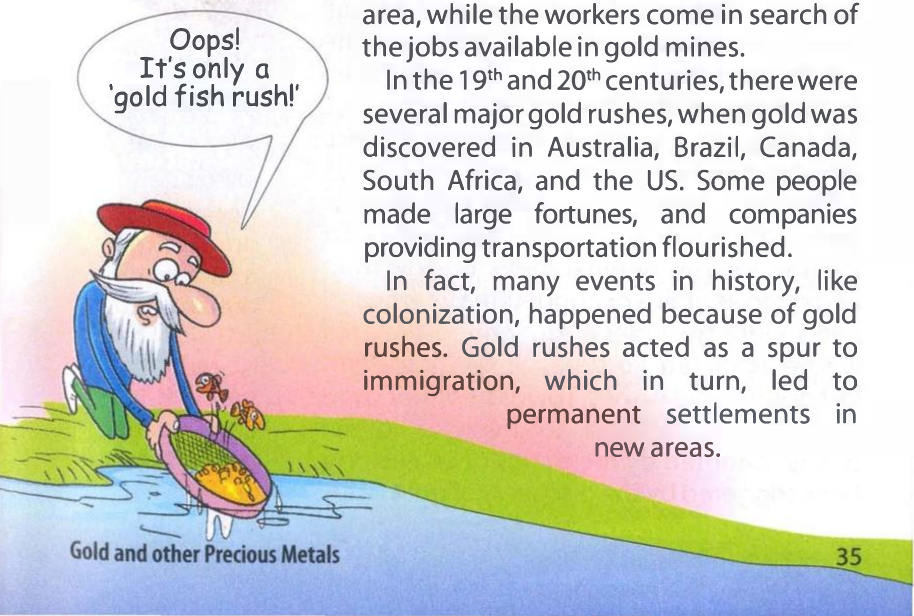
California Gold Rush-
A Painting

What is a gold rush?

The discovery of a new source of gold is usually followed by a gold rush, when both prospectors and workers rush to the area in large numbers. The prospectors hope to find more gold in the area, while the workers come in search of the jobs available in gold mines.

In the 19th and 20th centuries, there were several major gold rushes, when gold was discovered in Australia, Brazil, Canada, South Africa, and the US. Some people made large fortunes, and companies providing transportation flourished.

In fact, many events in history, like colonization, happened because of gold rushes. Gold rushes acted as a spur to immigration, which in turn, led to permanent settlements in new areas.


Oops!
It's only a 'gold fish rush!'

A Gold Mine in Australia

How can the life cycle of a gold rush be described?

A gold rush is usually started by the discovery of gold by an individual, or company. At first, the gold in streams or rivers may be washed from sand by individual miners, using a pan. If it seems like there is a fairly large amount of gold available, a small group will use rockers to wash gold from the sediment, many times faster than using gold pans. In case of really big deposits, companies may buy up individual claims, and more advanced techniques, requiring more capital, will be used. When the gold supply in streams starts diminishing, prospectors will start looking for the original lodes of gold that appeared as grains or nuggets in streams and rivers. Once the lodes are identified, the gold will be extracted. Fortunes can be made and lost during gold rushes. Towns boom, and are then are abandoned to become 'ghost towns', haunted by memories of an exciting time, triggered by the discovery of gold.

CURIOUS FACT

Gold in Medicine

Auranfin is a drug for the treatment of rheumatoid arthritis that is gold based. It was sold for the first time in 1985.

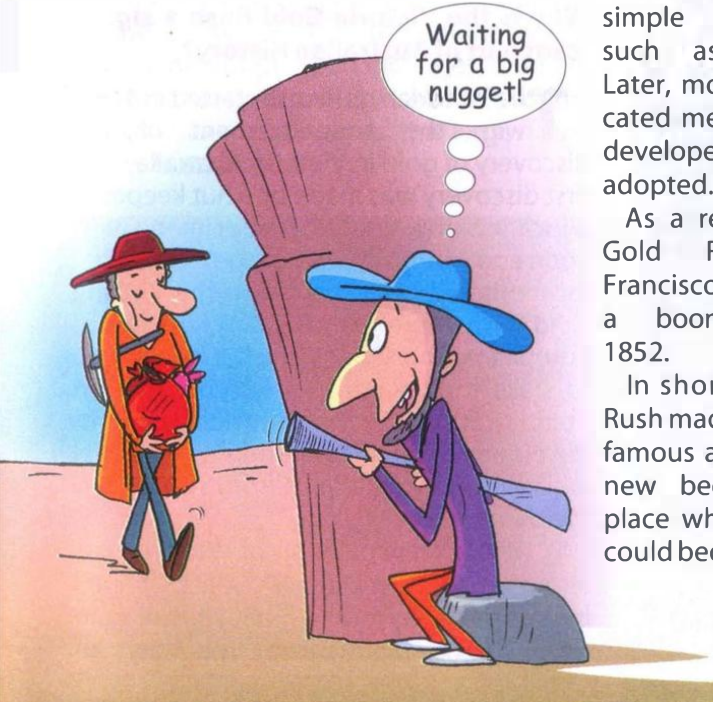
Why is the California Gold Rush historically important?

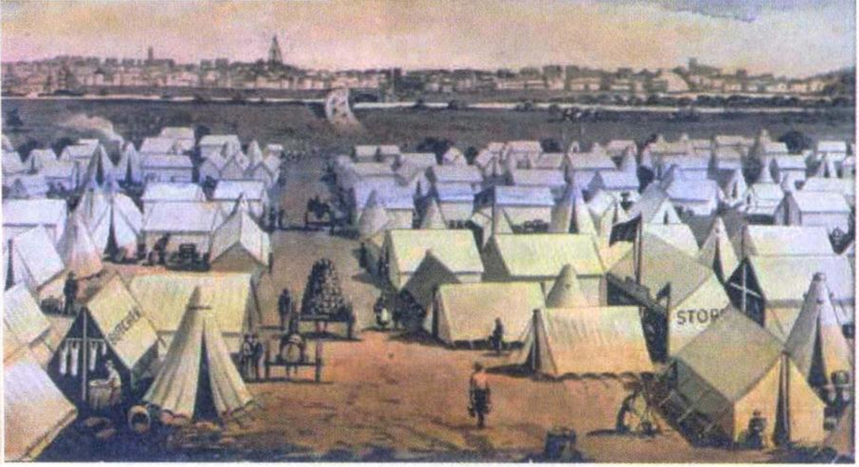
In 1848, nuggets of gold were discovered in the Sacramento Valley in California. This sparked a gold rush, and as news spread of the discovery, thousands of prospective gold miners travelled to San Francisco and the surrounding area. A total of $2 billion worth of precious metal was extracted from the area during the Gold Rush, which peaked in 1852.

The gold-seekers, called 'forty-niners', had to face great hardships before they finally reached California. At first, the gold nuggets could be picked up off the ground. Later, gold was recovered from streams and riverbeds using simple techniques, such as panning. Later, more sophisticated methods were developed and adopted.

As a result of the Gold Rush, San Francisco grew into a boomtown by 1852.

In short, the Gold Rush made California famous as a place of new beginnings; a place where dreams could become true.


Waiting for a big nugget!



A Town in South Melbourne during the Victoria Gold Rush

AMAZING

War & Gold

In 1939, when World War II broke out, the London Gold Market closed down. When the war was over, currencies were fixed to the dollar, which in turn was convertible into gold.

Why is the Victoria Gold Rush a significant part of Australian History?

The Victorian gold rush started in 1851, with the announcement of the discovery of gold in Victoria, Australia. The first discovery was made by a hut keeper at a location now known as Specimen Gully. Soon enough, gold was discovered in other locations too- and this led to the Victoria Gold Rush. More than 500,000 Australians, Europeans, and Chinese rushed to Victoria to stake their claim to a fortune built on gold. Locations that were previously forlorn developed townships overnight, as miners in search for fortune came from Sydney and Melbourne.

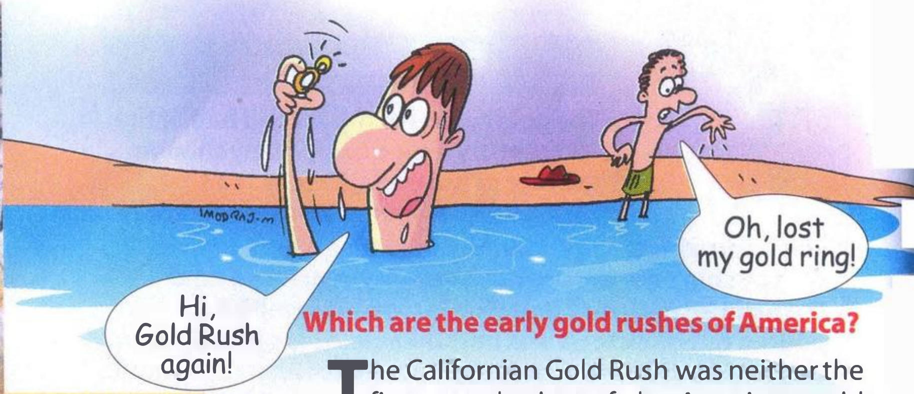
In 1850, the population of Victoria was about 76,000. Within 10 years, it had increased seven fold to 540,000. The gold rush heavily influenced the city of

Golden Change

The gold rushes in the second half of the 19th century would completely change the face of Australia. Before 1851, Australia's combined white population was approximately 77,000. Most of these were convicts, sent by ship over the previous seventy years. The Gold Rush put an end to all that. The incredible wealth that poured out of Victoria was unthinkable. Ships returning to England carried as much as eight tonnes of Australian gold. The Victorian Gold Rush would transform the British colonies in Australia into a nation.

Melbourne too. As the capital of Victoria, and the major city closest to the mining towns, Melbourne's population increased dramatically with the gold rush. By 1865, Melbourne had overtaken Sydney as the largest and richest Australian city.

Remains of A Gold Mine in Victoria


Hi, Gold Rush again!
Oh, lost my gold ring!

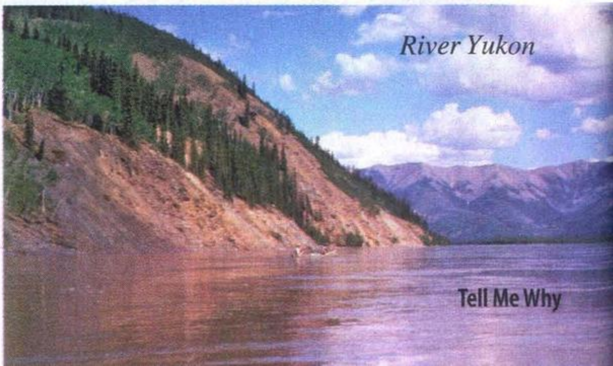
Which are the early gold rushes of America?

The Californian Gold Rush was neither the first, nor the last of the American gold rushes. The first one happened in North Carolina in 1803, and thirty years later, in 1829, the Georgia Gold Rush followed. The California Gold Rush led directly to the settlement of California and the entry of that state into the union in 1850. Lesser gold rushes over the next half-century left their traces elsewhere in the American West, in Nevada, Oregon, Colorado, and Utah. The Colorado gold rush began in 1859. Another gold rush was during the turn of the century, in 1898, in the Klondike district of the Canadian Yukon and neighboring Alaska. Modern mining companies moved in , and the days of amateur gold hunters striking it rich ended.

CURIOUS FACT

Gold Bonded Microchips

Many of our electrical devices have microchips bonded with gold bonding wire. This was first introduced in 1961, by the Bell Labs in the USA.

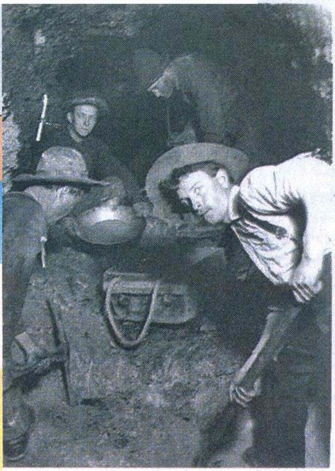

River Yukon

Witwatersrand, South Africa

What was the Witwatersrand Gold Rush?

On a Sunday in March 1886, a gold miner named George Harrison, stumbled across a rocky outcrop of main gold-bearing reef in Witwatersrand, South Africa. It did not take long for fortune seekers from far and wide to flock to the region, and another Gold Rush began. Initially, it seemed that the boom would be short-lived, as it became clear that the shallow gold would run out fairly quickly, leaving room only for the already wealthy few who could afford to go deeper. But in 1887, a significant new technology was discovered in Scotland, namely the extraction of gold using cyanide. This enabled deeper and deeper mining. This boom has continued for over a century, and while many of the Witwatersrand Basin's mines have now been exhausted, it remains one of the world's premier gold mining locations. The Witwatersrand Gold Rush led to the establishment of the city of Johannesburg in South Africa. The Witwatersrand Basin is the richest gold field the world has ever known.

How did the Klondike Gold Rush influence Canadian history?



Mining in Klondike

On August 16th, 1896, two Native Americans, Skookum Jim Mason and Tagish Charlie, along with George Carmack, found gold in Rabbit Creek in the Klondike, near Dawson, in the Yukon region of Canada. Since the Yukon was so remote, word of this find spread relatively slowly for almost a year. On July 17th, 1897, a steamship arrived in Seattle from Dawson with more than a tonne of gold-and the Klondike Gold Rush began. Within six months, approximately 100,000 gold-seekers set off for the Yukon.

As people poured in, Dawson temporarily became the largest city north of San Francisco. Dawson was not the only Canadian city to have dramatic growth. It is estimated that over one billion dollars worth of gold was found, adjusted to late 20th century standards, during the Klondike Gold Rush.

I need a food rush first!
To KLONDIKE

Gold in Space

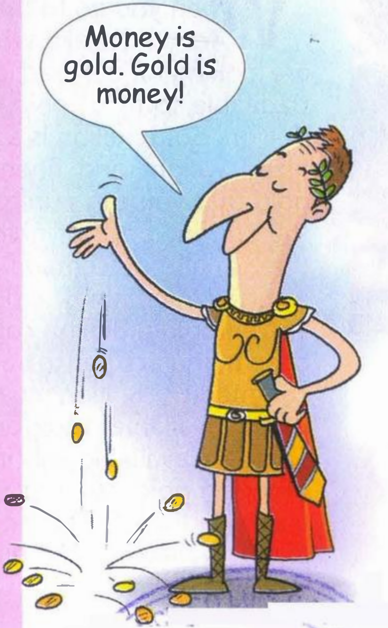
In 1961, gold was used to protect sensitive instruments from radiation during the first manned space flight. Forty one kg of gold were used in the construction of the space shuttle in 1981.

Why do gold coins play an important role in the history of gold?

Gold has been used as money for many reasons. It is easy to carry around, and has a high value compared to its weight. It can be divided into smaller units without destroying its value, and it can be melted down and re-coined. It does not tarnish, rust, or react easily with other compounds, and is rare.

King Croesus of Lydia is believed to have issued the first gold coins during the 6th century BC. Later, he was captured by the Persians and they too, started using gold to make coins. In the late fourth and third centuries BC, Rome accumulated great wealth in gold through its conquests. The first Roman gold coin was a stater struck in 215 BC. to help finance a war. But it was during the time of Julius Caesar that gold coinage became more widely used.

Gold coins enjoyed widespread circulation in the Roman Empire and found their way to other lands through trade.


Money is gold. Gold is money!

What are bullion coin?

When you go to buy gold for gold's sake, what you are looking for is a practical and tradeable form of gold - gold bullion. Gold bullion is a recognized weight and fineness of gold that you can purchase for the current price of gold, plus the small percentage costs incurred in refining, fabricating, and shipping. Bullion coins are coins manufactured to trade as a commodity. Bullion coins are usually available in gold or silver. Some are available only in gold, others in gold, silver, platinum, and palladium. Bullion coins are also available in different weights.

CURIOUS FACT

Gold in the Heart

Gold plated stents were used in heart surgery for the first time in 2001. The stents are inserted inside large arteries and veins to prop them open, so that blood can flow freely.

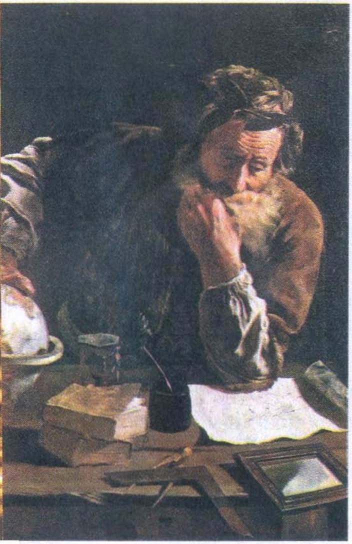
STAR FACT

18 K Gold

Gold jewellery in 18 Karat was launched in China in 2003. This move by the World Gold Council created an entirely new, and huge market for gold jewellery.

Why is the history of gold coins in India interesting?

India's history of issuing gold coins dates back almost 2,000 years. The earliest Indian coins were silver, and it was not until about 100 AD that the Kushan emperor Vima Kadaphises introduced the first Indian gold coin. It was a gold dinar bearing the image of Shiva. India has produced many different denominations of gold coins, which include Dinars, Staters, Kahavanus, Pagodas, Tankas, Ashrafis, Mohurs, Gadyanas, Bhairava Gadyanas, Varahas, Fanams, Koris, Xerafims, and Tolas. Indians love gold, and gifts of gold coins are very popular. In fact, many Indians store gold in the form of gold coins, or gold bars.

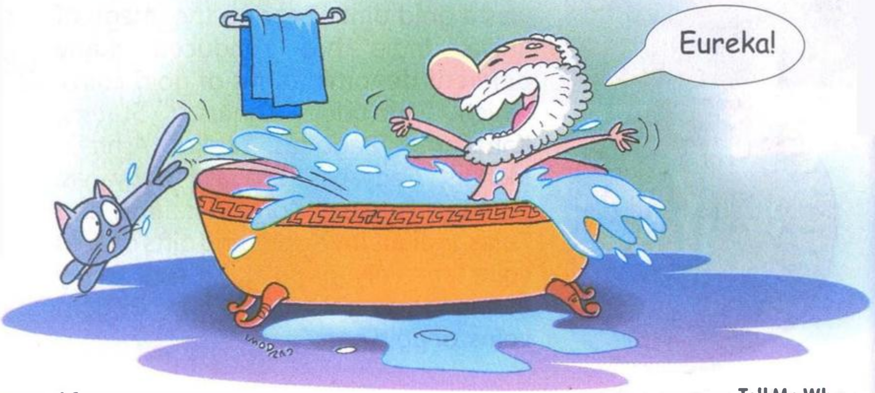


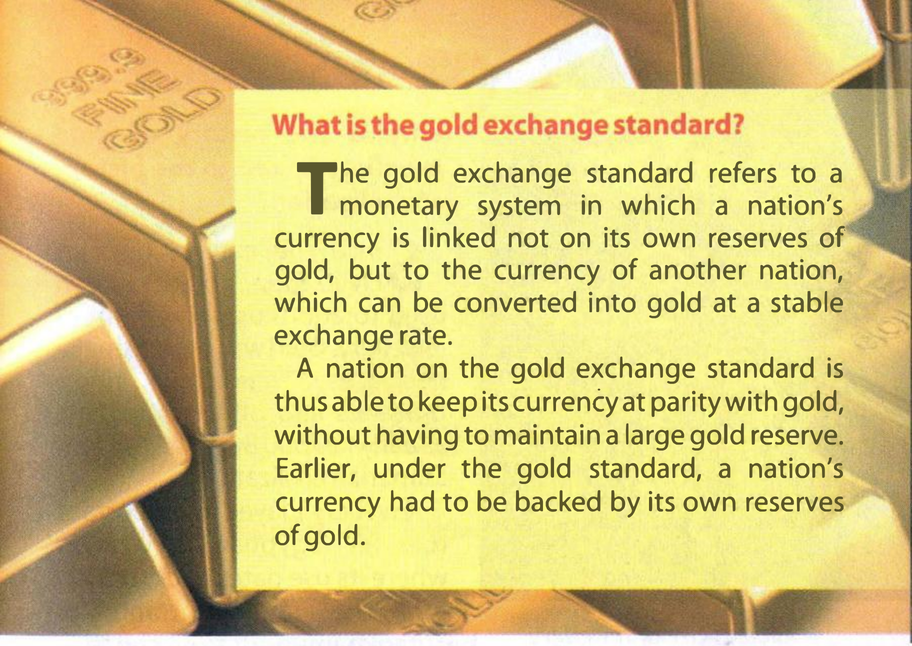
Archimedes

Why is Archimedes's Principle related to gold?

Long, long ago, King Hiero II of Syracuse asked his friend Archimedes to determine whether a crown was made of pure gold, or whether some silver had been added to it. This was a real challenge, because the king did not want the crown to be melted, or distorted in any way.

Archimedes was a genius, and the answer came to him while he was taking a bath. When he stepped into the tub, he saw that some of the water ran out. As more and more of his body went under water, more and more water flowed out. He realized that the volume of the water that was displaced was equal to the volume of his own body. Archimedes was so excited by this discovery that he ran out naked into the street shouting, 'Eureka' which means, 'I found it'.





What is the gold exchange standard?

The gold exchange standard refers to a monetary system in which a nation's currency is linked not on its own reserves of gold, but to the currency of another nation, which can be converted into gold at a stable exchange rate.

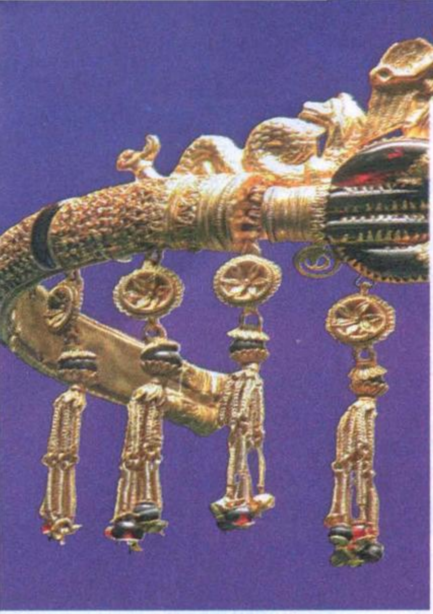
A nation on the gold exchange standard is thus able to keep its currency at parity with gold, without having to maintain a large gold reserve. Earlier, under the gold standard, a nation's currency had to be backed by its own reserves of gold.

Archimedes made two masses of the same weight as the crown, one of gold and the other of silver. He filled a large vessel with water to the very brim, and dropped the mass of silver into it. The amount of water that overflowed was equal in volume to that of the silver mass sunk in the vessel.

Archimedes next refilled the vessel, and dropped the mass of gold in to the full vessel. Not as much water overflowed, because gold is more dense than silver, so the same weight takes up less volume.

Finally, Archimedes filled the vessel again and dropped the crown itself into the water. He found that more water overflowed for the crown than for the mass of gold of the same weight. This meant that silver had been mixed with the gold- and the problem was solved!

Archimedes' principle is a law of physics stating that the upward buoyant force exerted on a body immersed in a fluid is equal to the weight of the fluid the body displaces.



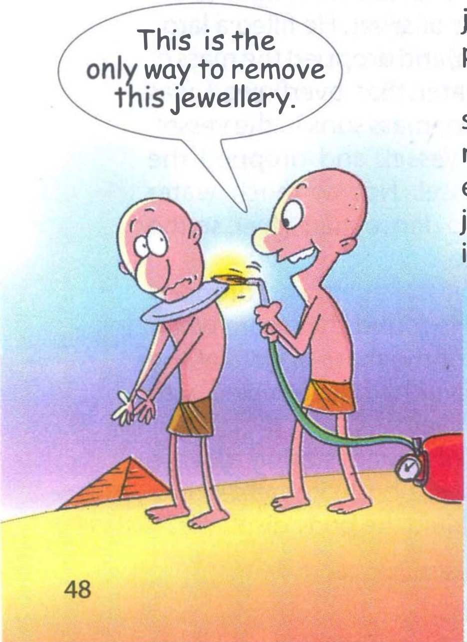
Ancient Greek Jewellery

Why is the history of gold jewellery linked to the history of civilization?

Since the earliest days of civilization, gold has been used to adorn us in the form of jewellery. Gold was used to make necklaces earrings, rings, bracelets and other ornaments as early as 2500 BC in the Ancient Sumerian civilization.

Jewellery played an important role in Egyptian civilization where its use dates back to 3000 BC. The famous tomb of Tutankhamun contains numerous pieces of fine gold jewellery, embedded with precious stones.

Metalworking techniques spread outward from Greece and reached northern Europe as early as 1800 BC. By 1200 BC, jewellery making was flourishing in Central and Western Europe.


This is the only way to remove this jewellery.

Forty Niners

The miners who took part in the California Gold Rush in 1849 were known as 'The Forty Niners'. Sadly, very few of them got rich.

An 18th Century Princess Crown

Why is the jewellery of Ancient Egypt fascinating?

Ancient Egyptian jewellery is amongst some of the most rarest, and exquisite pieces of jewellery ever made by Man. Both men and women wore beaded necklaces and finger rings, anklets, collars, bracelets, fillets and earrings as part of their everyday dress. Egyptians understood fire assaying to test the purity of gold, mastered the art of alloying it with other metals for hardness or colour variations, and casting, including the lost-wax technique, which remain at the heart of much jewellery manufacture.

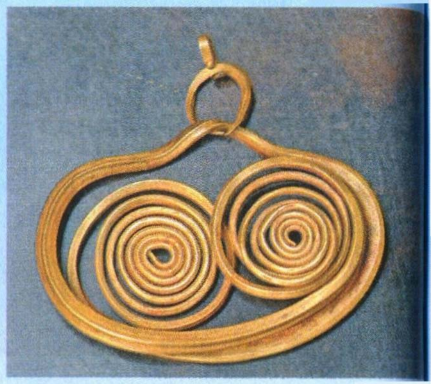
The Ancient Egyptians wore ornamental jewellery for many reasons, but mainly because of superstitious beliefs. Most of the adornments worn were crafted out of stone. The Ancient Egyptians believed that gold represented the flesh of the gods, and the fire and glory of the sun. Since its lustre never dimmed it stood for eternal well being.

S-T-R-E-T-C-H

One ounce of gold can be stretched into a very fine wire that is 80.4 kilometres long! This is because gold is a very soft and ductile metal.

Why is Minoan and Mycaenean gold jewellery a reflection of the times?

Between 2500 BC and 500 BC, Minoan craftsmen, working in Troy and in Crete, crafted exquisite jewellery that marked the beginning of the Classical period of Greek art. Typical items of Minoan jewellery consisted of thin coils and chains of linked and plaited gold wire, and thin gold foil fashioned into petals and rosettes. The Minoan Civilization in the early 2nd millennium BC is credited with producing the first cable chain jewellery. The gold jewellery made by the Minoans was, from the start, a reflection of rural Crete. By the middle of the 2nd millennium BC, Mycenae was one of the major centres of the Greek civilization. Jewellery found at Mycenae, and in Crete, includes a great number of small gold discs, perforated so that they could be attached to clothing, and gold diadems made of long oval plates covered with rosettes. Some of the best known pieces of this time are the gold masks and massive gold rings found at Mycenae at the end of the 19th century.



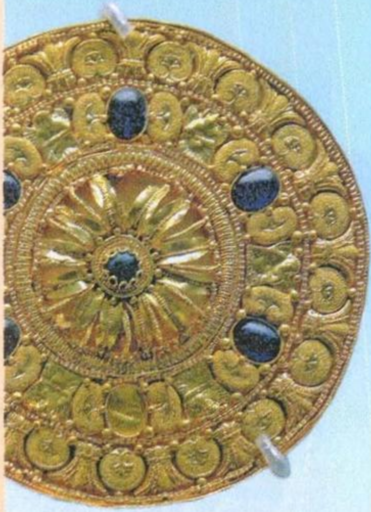
A Golden Ear ring From Mycenae (16th Century)

This chain looks like Minoan jewellery.

What do we know about gold jewellery in Etruria?

Art and craftsmanship flourished in Etruria from about 700 BC. The Etruscans prided themselves particularly on their techniques of filigree, or delicate tracery in gold wire, and granulation, in which tiny particles of gold were used to create an intricate pattern.

Over 5000 individual grains of gold were sometimes used to cover an ornament. It was immensely time-consuming, painstaking work, and indeed, jewellery historians have long wondered how they did it. This preoccupation with the intricate and miniscule may have been because of the difficulty in getting enough gold for heavier types of ornaments. Etruscan jewellery is a showcase for the goldsmiths' art.



Etruscan Ear Studs

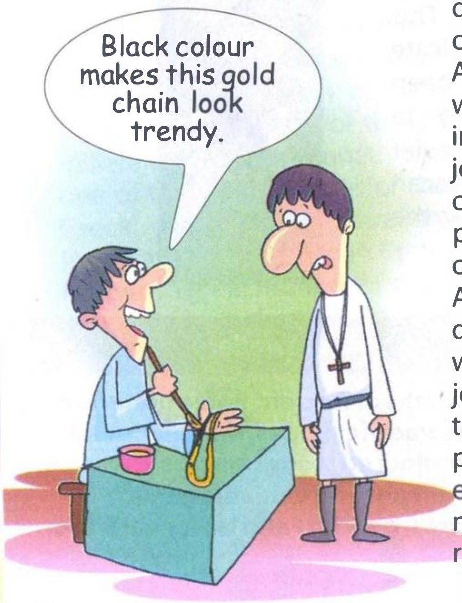
Roman Jewellery

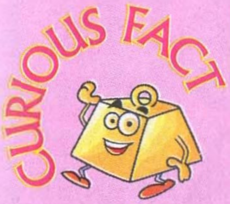
The goldsmiths of Ancient Rome preferred plainer, geometric shapes. Romans loved gems and coloured stones, and gold was often used as a setting for brilliant and valuable gems, including emeralds, sapphires, peridots and later pearls too.

Byzantine Belt Buckle

Why is the history of Byzantine jewellery interesting?

In 325 AD, the Emperor Constantine The Great made Christianity the official religion of the Roman Empire. This move was reflected in the jewellery in those days, as many Christian symbols like the cross and enamelled images of saints became popular with goldsmiths and designers. Production in the old jewellery centres of Alexandria and Antioch gave way to an increased production in Constantinople. Byzantine jewellery had a huge influence on the manufacturing of personal decoration in the rest of the Medieval World. In 529 AD, Emperor Justinian introduced new laws regulating the wearing and usage of jewellery. He explicitly writes that sapphires, emeralds and pearls are reserved for the emperor's use, but every free man is entitled to wear a gold ring.


Black colour makes this gold chain look trendy.



Round and Round

If all the gold in the world were to be stretched in a thin wire of 5 microns thickness, the wire could go round and round the world 7.2 million times!

Gold - Chavin Era

What were the features of pre- Columbian Jewellery?

The term pre- Columbian jewellery refers to the jewellery of South America- especially Colombia and Peru- before Columbus discovered America. Around 1200 BC, the first great Peruvian civilisation of Chavin was already making gold ornaments by hammering fine sheets of metal, and decorating them with embossing. The technique of casting gold was developed by the Nazca people in the deserts of southern Peru before 500 AD. During the Chimu Empire, between 1150 and 1450 AD, goldsmiths also perfected lost wax casting, alloys, welding and plating.

A recurring theme in pre-Columbian crafts was the use of crocodiles, deer, jaguars, serpents, birds and plant-like imagery.

What do we know about modern jewellery?

In modern times, there has been a fundamental change in attitude towards gold jewellery, both in terms both of its design, and its function. There was an increase in the supply of gold, and the middle classes were now able to afford gold jewellery too. A complex and innovative style called Art Noveau became very popular, and it was characterized by its curving and undulating lines. The emphasis was on design rather than the intrinsic value of materials. The late 20th century was marked by the blending of European design with oriental techniques, to produce truly breathtaking gold jewellery.

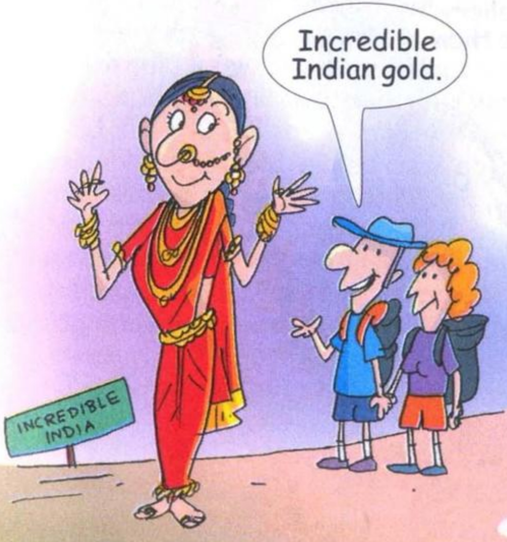
Gold in Early Europe

In Early Europe, the Saxons, Franks, and Merovingians all developed their own styles of jewellery that were very impressive. However, gold was scarce in Europe, and had to be imported from the Byzantine World. As a result, gold was often mixed with silver, which was more easily available. Copper was also used sometimes, and gold jewellery became rare.

What were the features of gold jewellery in Ancient India?

Ear rings, nose rings, chains, bangles and anklets have all been worn by India women, since times immemorial. Kanjeevaram in South India, and Varanasi in North India, were the centres of gold jewellery in Ancient India.

Hindus associate gold with the Goddess Lakshmi, and it has always been considered to be an auspicious metal. With the coming of the Mughals, gold jewellery in India got an international flavour. It was the Mughals who perfected the use of gold thread for embroidery. The Mughal court in India was famous for its lavish display of gem encrusted gold jewellery and ornaments. India was also a major source and trading centre for precious stones. Europeans lusted after Indian gold and kept trying to find easier ways to get to it.



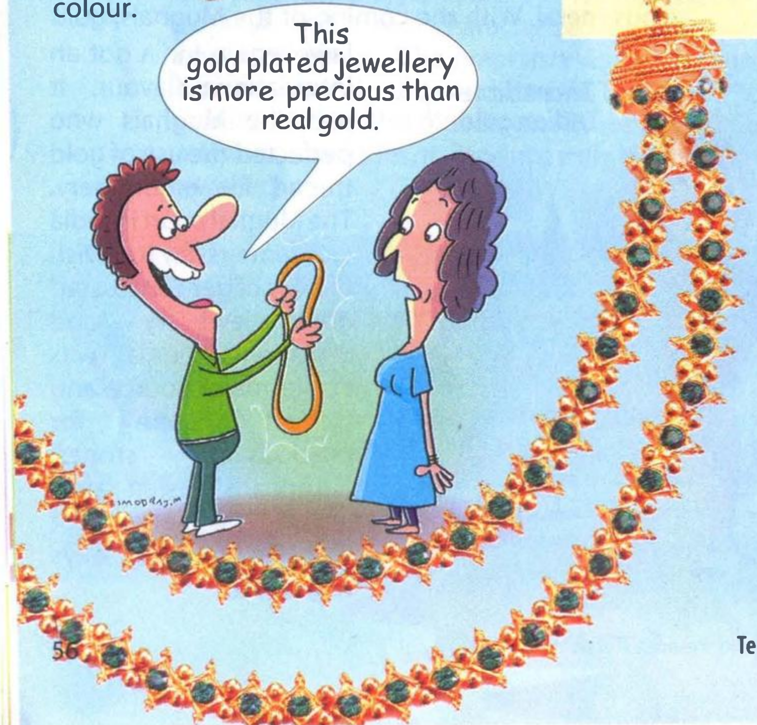
What is gold plated jewellery?

Gold plated jewellery is jewellery made of metals like silver, and covered with a thin layer of gold. The layer of gold is applied to the base metal by an electrolytic process and the finished product looks exactly like pure gold. The layer of gold on gold plated jewellery is extremely thin. Differing thicknesses of gold can be applied to the base metal to increase the durability of gold plated jewellery. Gold plated jewellery is much, much cheaper than real gold jewellery, but can be equally beautiful. However, gold plated jewellery has a tendency to lose its gold colour.

CURIOUS FACT

Gold in the Renaissance

During the period of the Renaissance, goldsmiths enjoyed the same prestige as artists and sculptors.


This gold plated jewellery is more precious than real gold.

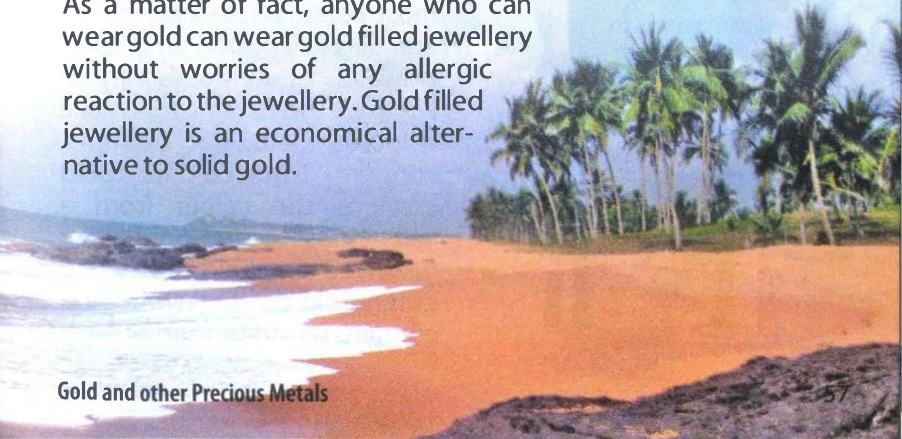
Why is gold filled jewellery different from gold plated jewellery?

In gold filled jewellery, the gold is not applied as a thin layer. Rather, the gold is bonded to the base metal by applying heat and pressure. Gold filled jewellery looks just like real gold, and unlike gold plated jewellery, it does not tarnish, and its brilliance does not fade. Gold filled jewellery is much more valuable than gold plated, and does not flake off, rub off, or change colour. As a matter of fact, anyone who can wear gold can wear gold filled jewellery without worries of any allergic reaction to the jewellery. Gold filled jewellery is an economical alternative to solid gold.

STAR FACT

The Gold Coast

The Gold Coast of West Africa, now known as Ghana, was one place where the goldsmith's art flourished from the 16th to the 19th centuries. This region was an important source of gold for the world.



STAR FACT

Thin... Thinner

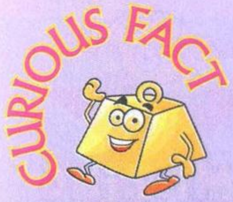
Pure gold is so soft that just an ounce can be hammered into a single sheet that is 9 square metres in size.

Rhodium Plated White Gold Ring

What is coloured gold?

Pure gold is yellow in colour. However, the gold that is used in jewellery is a mixture of gold with another metal. The purity or fineness of gold in the jewellery is indicated by its karat number. 24 K gold is also called fine gold, and is more than 99.7 percent pure. Gold will form alloys with most metals, but for jewellery, the most common alloying metals are silver, copper, and zinc. However, other metals may be added, especially to make coloured gold. For example, copper dissolved in gold changes the colour from a yellow-gold to a red-gold. Silver dissolved in gold creates a green-gold colour. White gold contains palladium and silver.

Believe me, this is gold - green gold.



Hot...Hotter

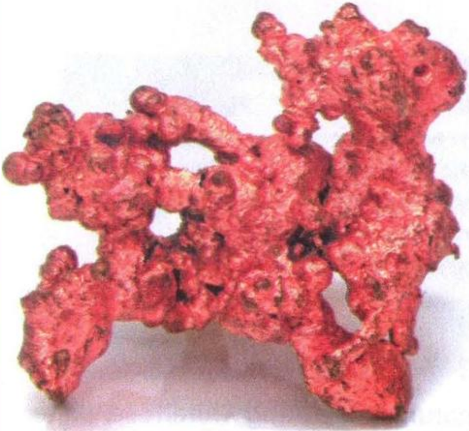
Very hot temperatures are needed to melt gold, for gold melts only at 1064 degrees centigrade. Even hotter temperatures are needed to boil it, for gold boils only at 2808 degrees centigrade.

Why is white gold different?

There is no such thing as naturally occurring white, rose, white, or green gold. Gold itself is only one colour-yellow. All of these other 'colours' of gold are produced by mixing pure 24K yellow gold with various other metals. When gold is mixed with nickel, manganese or palladium, you get an alloy of gold that is white in colour, and is called white gold.

While white gold contains varying amounts of gold, which is always yellow, it also contains one or more white metals to lighten its colour and add strength and durability. Its properties differ depending on the metals used, and the proportions in which they are present. When nickel is used, the alloy is hard and strong, and excellent for making rings and pins. If gold is mixed with palladium, the resulting alloy is soft and pliable, making it suitable for gem setting. Sometimes, an alloy of gold is made up of two metals, instead of just one.

Palladium



Copper

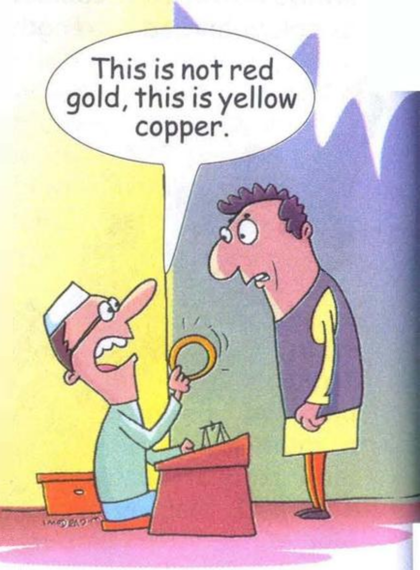
What are rose, red and pink gold?

Rose Gold is also known as pink gold and red gold. It is a gold and copper alloy. The difference between rose, pink, and red gold is the amount of copper that is used. When more copper is used, the shade will be deeper. Rose gold is 75 percent gold and 25 percent copper by mass, while red gold is 50 percent gold, and 50 percent copper. Rose gold is available in both 14K and in 18K. In 14K, rose gold has a more pronounced rose colour. Rose Gold has been fashionable since the 19th century, particularly in Russia. It is now popular all over the world. Rose gold has all the same properties as yellow gold, and is perfect for any kind of jewellery including bracelets, necklaces, rings, and earrings.

AMAZING

Tonnes and Tonnes

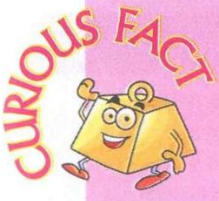
171,300 tonnes of gold have been mined since civilization began, and 90 percent of it was since the California Gold Rush of 1849.


This is not red gold, this is yellow copper.

What is green gold?

Green Gold alloys use just silver and copper. Green Gold of 18 Karat is made up of 75 percent gold by mass, and 25 percent silver by mass. It has a greenish yellow colour. Green gold also appears as a naturally occurring alloy of silver, and was known to Lydians as long ago as 860 BC, by the name electrum. Most green gold alloys are rather soft to be used for general jewellery purposes, but they can be used very effectively for decorative effects on hand-made pieces of jewellery. Some gold-copper-aluminum alloys form a fine surface texture at heat treatment, yielding an interesting spangling effect. This is known as Spangold.

Electrum Coins (6th Century BC)



Friendly Gold

Our bodies have a normal temperature of 37 degrees centigrade. Gold's conductivity is so unique that the temperature of the gold jewellery you wear rapidly matches your body's temperature – and the result is that you feel comfortable wearing gold.

Where is black gold used?

In recent years, thanks to new technologies, new gold jewellery colours have evolved, you can even get gold that is black!

Black Gold can be created using quite a few techniques. These include using black rhodium or ruthenium, amorphous carbon, and oxidation of carat gold containing chromium or cobalt. A range of colours from brown to black can be achieved on copper-rich alloys by treatment with potassium sulfide. More recently a laser technique has been developed that renders the surface of metals- including gold- deep black. Black gold jewellery is most striking and dramatic in appearance, and is considered to be a fashion statement today.

What is electrum?

Electrum is an alloy of gold that occurs naturally, and can also be made artificially. This alloy of gold has at least 20 percent silver, with trace amounts of copper, and other metals. Most natural electrum contains copper, iron, palladium, bismuth, and perhaps other metals. The colour varies from white-gold

Golden Music

Rose gold is also used in musical instruments. Some flutes are made from solid Rose gold. As you can imagine, they are much more expensive than ordinary flutes.

Electrum Coins of Byzantine Emperor Alexius 1

to brassy, depending on the percentages of the major constituents and copper. Lydia, in Asia Minor, was the chief source of naturally occurring Electrum in ancient times. The use of electrum goes all the way back to the third millennium BC, during the days of the old Kingdom of Egypt. Electrum was used for making ancient wine cups and in some places coins. The first known coins in the Western world were also made of Electrum.

How do you get purple and blue gold?

Alloying gold and aluminium makes purple gold. Purple gold is often used to highlight white gold jewellery. This unique 19K Gold is composed of 80 percent 24K gold and 20 percent precious metals. Purple gold is developed at 10,000 degrees Celsius through a sophisticated process known as plasma vacuum pressure casting.

Blue gold is made by the interaction of gold and indium with manufacturing techniques being similar to those used to make purple gold. Both blue and purple gold have proved to be trendsetters in internationaljewellery styles.

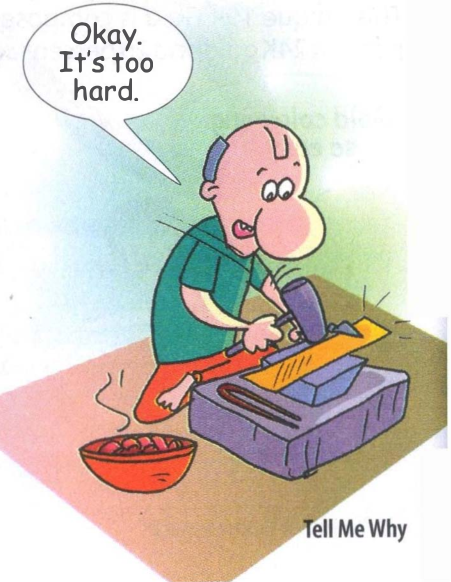
Why is gold mixed with copper to make jewellery?

Pure gold is very soft. It is also is a very malleable and very dense metal. The word 'malleable' means that it can beaten easily into sheets, while 'dense' refers to the fact that there is more gold for the same volume than there is for a metal like iron. So if necklaces or earrings were made from pure gold, they would get crushed easily and be very, very heavy to wear. That is why goldsmiths add metals like copper and silver to gold to make jewellery. Adding copper or silver not only makes gold easier to work with, but makes the finished product harder too. Copper is melted together with gold to make an alloy, which can then be beaten, drawn or twisted into various patterns. Adding copper to gold also makes the gold appear brighter. Pure gold is 24 Karats gold, but the gold used for making jewellery is 22 K or 18K.

CURIOUS FACT

Golden Gift

After the defeat of Gaul, Julius Caesar gave each of his soldiers 200 gold coins as a gift.


Okay. It's too hard.

Why is gold the perfect choice for jewellery?

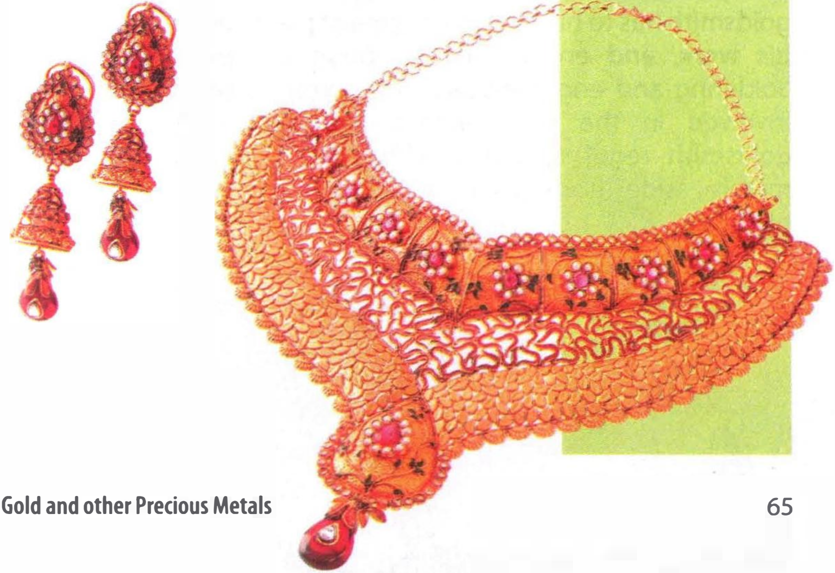
Gold is beautiful. Its unique shine and glitter make it perfect for jewellery. It does not tarnish, rust, or react in any way when exposed to other elements. Gold can be stretched into strands thinner than your hair, and hammered into fine sheets.

Gold is easier to work with when mixed with small amounts of silver, copper, or other metals. The resulting alloy is stronger than pure gold too, which makes ornaments more durable. When you buy gold jewellery, look for the BIS Hallmark sign. This is the Indian Government's guarantee of the amount of pure gold present in the jewellery. Hallmarking of gold is important, because it determines the actual quality and proportion of gold content in a jewellery design.

STAR FACT

Grey Gold

Did you know that gold can even be grey in colour? When silver, manganese and copper are added in specific ratios to gold, you get gold with a greyish hue!



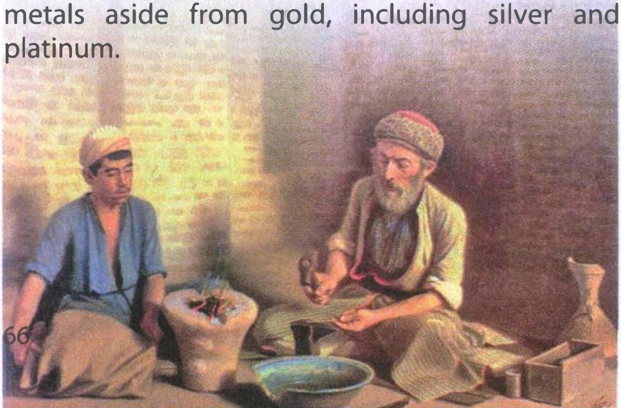
Medal Tally

To make the gold medals for the 2012 London Olympics, eight tonnes of silver, gold and copper from Utah and Mongolia were sent to Spain where they were turned into discs. These discs were then sent to the Royal Mint. Each medal takes 10 hours to make.

What does a goldsmith do?

A goldsmith is a craftsman who specializes in making creations in gold and other precious metals. He designs, shapes, creates, and repairs ornaments. In the past, goldsmiths also made silverware, plates, goblets and utensils, but now-a-days, a goldsmith works mainly on jewellery.

Jewellery often begins by carving wax to make a model for casting the metal. This, along with the ability to cut and polish gemstones, means that a goldsmith has to have a high degree of precision in his work, and ensure fine attention to detail. Soldering and engraving are also common tasks involved in the gold jewellery profession. A goldsmith regularly works with other precious metals aside from gold, including silver and platinum.



A Goldsmith at Work

You are awarded this silver gold medal!

When are gold medals av

A gold medal is a recognition given for the highest achievement in a field other than the military. It gets its name from the fact that there is at least some gold in the medal- either in the form of plating, or as an alloy. Gold medals are awarded in the field of arts, sports, science, and academics. Some gold medals are of solid gold, while others are gold plated. Nobel Prize gold medals are made of silver, plated with 24 karat gold.

What do you we about gold and the Incas?

The Incas were a civilization that dominated the Andes region for more than a century between 1400-1553. The Incas believed that gold was the sweat of the Sun God, who was the Supreme Being in their religion. In the 16th century, the Inca king Atahualpa was captured by the Spanish invaders. The Spanish commander agreed to release Atahualpa in return for a roomful of gold, but he later had the Inca king put to death before the last, and largest part of the ransom had been delivered. According to legend, the gold was buried in a secret mountain cave. Since then, people have been searching for the gold of the Incas.

Dear God, please give me some sweat.

Muisca Raft - A Model that Represents the El Dorado Ceremony

What is El Dorado?

In the 16th and 17th centuries, Europeans believed that somewhere in America there was a land of unimaginable wealth which they called El Dorado. The legend began because of a ceremony conducted by a native American tribe. During this ceremony, a new ruler was covered with gold dust, and then gold and precious jewels were thrown into the lake to appease a god that lived underwater.

The Spaniards started calling this legendary golden chief El Dorado, or 'the gilded one'. The great English explorer Sir Walter Raleigh went on two expeditions to try and find El Dorado, but without success. However, the legend of El Dorado lives on.

STAR FACT

Biggest Nugget

The biggest gold nugget ever discovered weighed 2300 troy ounces. It was found near Moligul in Australia in 1869, and was called 'The Welcome Stranger'. Depending on the currency exchange rate, this nugget could be valued at between two and and four million dollars.

CURIOUS FACT

Gold Purity

The purity of gold is expressed in parts per thousand. Pure gold, or 24 Karat gold is 999/1000 pure- or 99.9 per cent pure. It is also possible to produce gold of 99.999 per cent purity for use in technology. Jewellery of 22 Karats is usually made with 916 pure gold.

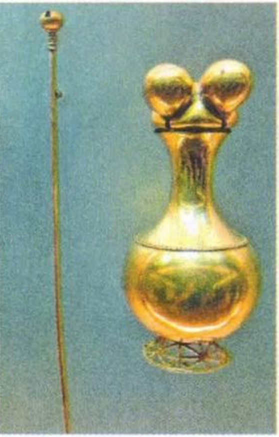
Olympic Gold Medal-Paris, 1900

Why is the history of gold medals in the Olympics an interesting one?

In Ancient Athens, no medals were given to the winners of the Olympic events. Rather, they were crowned with laurel wreaths! Interestingly, the first modern Olympic Games did not award gold medals either. The precious metals in the awards were introduced in the 1896 games. Then, it was silver for first, and bronze for second, along with an olive branch. It was not until the 1904 games that the traditional awards we know today- of gold, silver, and bronze- were first given.

Today, the design of the gold medal is decided by the host country, and their National Olympic Committee. Each medal must be essentially circular, with the ability to attaching a ribbon to it. It must be at least 60 millimetres in diameter and 3 millimetres thick, and must be composed of silver covered with 6 grammes of pure gold. The first gold medals weighed 21 grammes, while the gold medals for the 2012 Olympic Games in London weigh around 400 grammes.

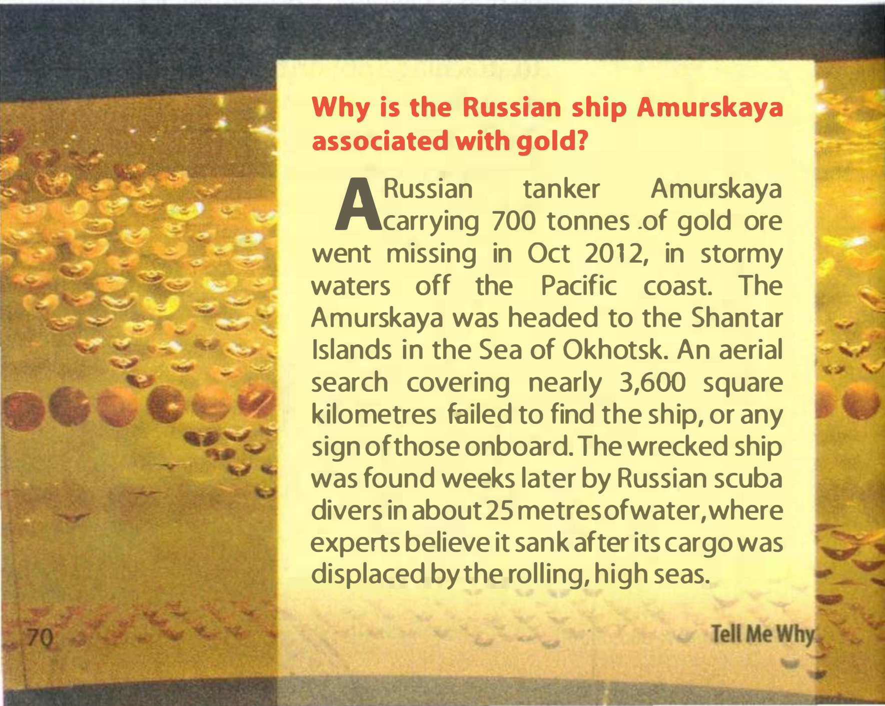
He got a medal for weight lifting!



Gold in Colombia Museum

Why is the Gold Museum in Colombia important?

The Gold Museum in Colombia showcases the extraordinary craftsmanship of the ancient civilizations in South America for whom gold was associated with the Sun God. These cultures used gold for decorations, jewellery, and religious ceremonies. The collection includes bracelets, earrings, necklaces, breast plates, masks, figurines, and rings created from 500 BC until the Spanish arrived in the 16th century. It is the largest such collection in the world, and has more than 30 thousand pieces of gold artefacts.



Why is the Russian ship Amurskaya associated with gold?

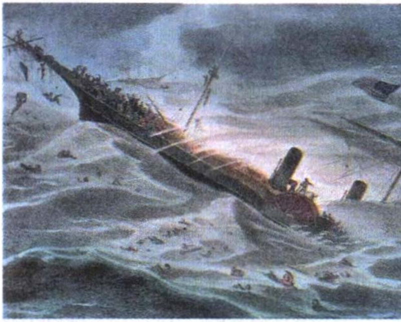
A Russian tanker Amurskaya carrying 700 tonnes of gold ore went missing in Oct 2012, in stormy waters off the Pacific coast. The Amurskaya was headed to the Shantar Islands in the Sea of Okhotsk. An aerial search covering nearly 3,600 square kilometres failed to find the ship, or any sign of those onboard. The wrecked ship was found weeks later by Russian scuba divers in about 25 metres of water, where experts believe it sank after its cargo was displaced by the rolling, high seas.

Why was the ship called SS Central America the 'ship of gold'?

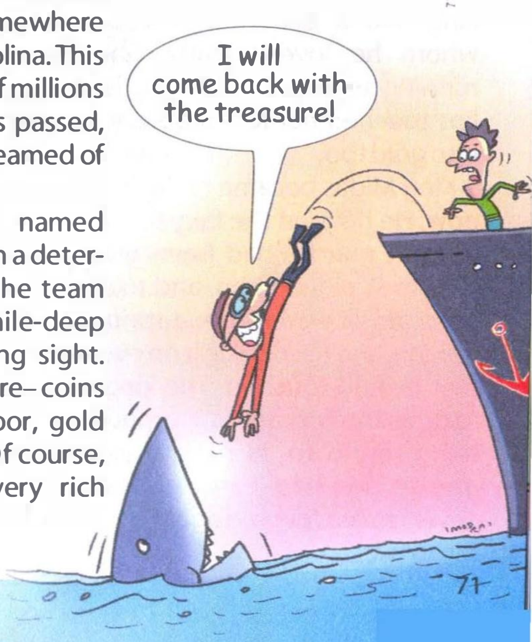
In September 1857, an elegant steamship, the SS Central America was heading from Havana, Cuba, to New York City. The ship was filled with treasure–21 tonnes of gold. Many of its passengers had been on the final leg of a journey back from the gold fields of California. Crates of gold bars were stacked in the Central America's cargo hold.

On September 12th, the SS Central America sailed into the path of a furious hurricane. It sank, and 425 people died. The ship came to rest in mile-deep waters somewhere off the coast of South Carolina. This treasure was worth tens of millions of dollars. As the decades passed, many treasure hunters dreamed of finding this ship.

In 1980, an engineer named Tommy Thompson began a determined search. In 1989, the team found the wreck in mile-deep waters. It was an amazing sight. There was gold everywhere– coins blanketing the ocean floor, gold bars stacked up neatly. Of course, Thompson became a very rich man indeed.



SS Central America - A Painting


I will come back with the treasure!

What is the story of King Midas?

Once upon a time, there lived a very rich king called Midas. He had more gold than anyone else in the world, but he was not satisfied. In fact, he loved gold more than anything else in the world. One day, a fairy appeared before him, and told him that he would be granted one wish. The king asked that everything he touched should turn into gold!

To his joy, his wish was granted. The next morning, he touched his bed, a chair, a table and to his delight, they all turned into solid gold. The king was overjoyed, and went to have his breakfast. But alas, he could not eat or drink anything, because everything he touched turned into gold. Now, the king had a beautiful little daughter whom he loved dearly. She came running to kiss him. When the king's lips touched her forehead, she turned into gold too.

King Midas became really frightened now. He begged the fairy to take away the gift that he had been given. The fairy took pity on him, and told him to get a jug of water from a spring in the garden, and to sprinkle it on everything that he had touched. The king rushed to do as the fairy asked. He made everything return to its natural form. The greedy king had learnt his lesson. He never craved for gold again.

Midas' Daughter Turns into a Golden Statue- A Painting

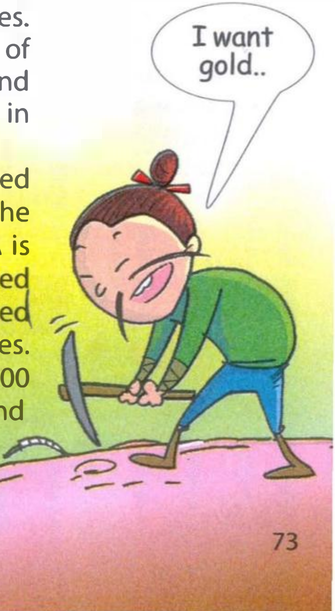
I will turn it into gold!

Rosia Montana Gold Mine-Romania

Which are the leading gold mining countries?

Gold is mined in over 90 countries worldwide. The top ten gold producing nations are spread over four continents. According to the 2011 statistics, they together produced 1800 tonnes of gold. China is the top producer of gold, and its gold production exceeded 300 tonnes. Australia comes next, with 270 tonnes of gold being mined. Though gold is found across the nation, most of it- two thirds in fact- is mined in Western Australia.

The United States of America produced 237 tonnes of gold, and comes third in the list. Most of the gold mined in the USA is from Nevada. In addition, Russia produced around 200 tonnes, South Africa produced 190 tonnes and Peru produced 150 tonnes. Canada mined 110 tonnes of gold, and 100 tonnes each were mined in Ghana and Indonesia, and 90 tonnes were produced in Uzbekistan.



A Jewellery Shop

Why is there a huge demand for gold in India?

Gold has a very special place in India. It plays an important role in the life of an Indian, socially, spiritually, and financially. Gold is linked to religion, rituals, and ceremonies. It is considered to be a manifestation of the Goddess Mahalakshmi, the symbol of prosperity and auspiciousness.

Indian brides are covered with gold, babies wear it, married women flaunt it. In every level of society, from the very rich to the struggling poor, gold represents security. It is saved and hoarded, it is gifted, and inherited. It is not surprising therefore, that in 2011, India was the world's largest consumer of gold! It represents almost 20 per cent of the world's demand for gold, and the demand keeps on increasing.

STAR FACT

Fool's Gold

Pyrite is a mineral that is often called 'fool's gold' because of its brassy yellow colour. It is actually an iron sulphide. Pyrite is much lighter, but harder than gold, and cannot be scratched with a fingernail or pocket knife.

Which are the leading gold markets in the world?

India is the biggest market for gold in the world. The other leading markets are China, the United States, and Germany. In 2011, China was the second largest consumer of gold, with a total tonnage of 811.2 tonnes. This huge demand was created by an increase in the demand for gold jewellery, and gold for investment, mainly in the form of gold bars and coins.

The United States demand for gold was 194.9 tonnes. There was a slight fall in the demand because of domestic economic problems. Germany's demand for gold in 2011 showed an increase of 26 per cent, and jumped to 159.3 tonnes. Turkey, Switzerland, Thailand, Vietnam, Russia and Saudi Arabia are other leading gold markets.

I am going to India to sell this gold!
GOLD

Max von Laue

Nobel Prizes

When Germany invaded Denmark in World War II, Hungarian chemist George de Hevesy dissolved the gold Nobel Prizes of German physicists Max von Laue and James Franck in aqua regia to prevent the Nazis from confiscating them. After the war, de Hevesy precipitated the gold out of the acid. The gold was returned to the Royal Swedish Academy, which recast them, and presented them once again to the award winners!

Which countries have the biggest reserves of gold?

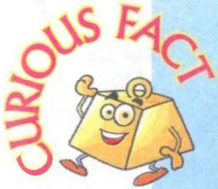
We have already discussed which countries produce the most gold, and which are the biggest consumers of gold. Now let us look at the countries that have the biggest reserves of gold. They are the United States, followed by Germany and Italy.

The US has the largest holdings of any country by a wide margin. While most of the gold is held at Fort Knox in Kentucky, gold is also held by the US Mints in Philadelphia and Denver, and several other locations. The official gold holdings of the US stand at 8,133.5 tonnes. The Deutsche Bundesbank in Frankfurt, is the manager of Germany's gold reserves. Germany holds 3,395.5 tonnes of gold. Italy holds 2,451.8 tonnes of gold. The country's reserves are held and managed by the Banca D'Italia. France, China, Switzerland, Russia, Japan and the Netherlands, as well as India, all have huge reserves of gold too.

Shhh...
Uncle Sam keeps all the gold!
GOLD

Golden Buddha

The world's largest statue made of solid gold is located in Bangkok, Thailand. It is 3 metres tall, and weighs 5.5 tonnes. This statue is known as 'The Golden Buddha', and the gold in the statue is estimated to be worth $250 million.



Golden Jubilee

A 50th anniversary is referred to as a golden jubilee. It is known as a golden jubilee because, the fifty years that have been completed are considered to be as precious as gold.

Why is gold a good investment?

Many people prefer to keep their savings in gold rather than put it in a bank, because money in the bank is in the form of currency, and all currencies of the world today are what are known as 'fiat currencies'. Fiat currency in simple terms is money that is not backed by anything tangible, such as gold silver, oil. If an economy is not doing well, the value of its currency also falls. So, people consider gold as a 'safe haven' in economic turmoil.

There is a finite amount of gold on Earth, and only limited amounts available for sale. So, if a currency crashes, there will be only a limited amount of gold available. As a result, there will be massive increase in demand, and people consider it as a good investment.

JEWELLERS
Hurry up! I want a ring before the next price hike..

Why does the price of gold keep changing?

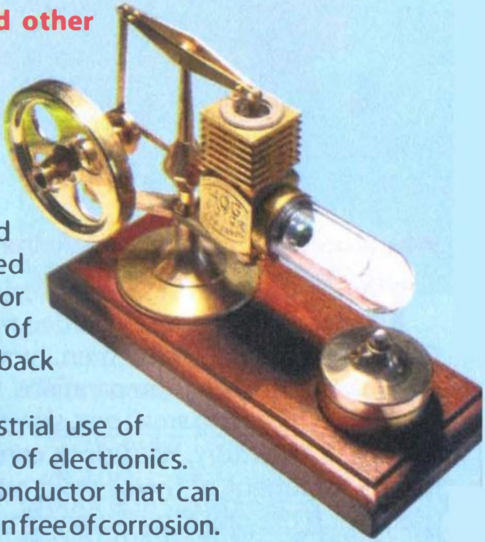
Like everything else, the price of gold changes according to supply and demand. Generally speaking, there isn't enough gold being produced to satisfy rising demand. The above-ground stock of gold is around 160,000 metric tonnes, and grows about 2,400 tonnes a year, which is only 1.75 percent - while demand keeps expanding at a much faster rate.

When financial crises rock the global stock markets, investors prefer to buy gold, rather than stocks and shares. Even those who don't play the stock market have found that the value of paper currency sometimes decreases, but gold retains its purchasing power, and so they buy gold to safeguard their wealth. Banks also buy gold in bulk, as security. The price of gold is also affected by the value of US dollar, because the dollar is the global trading currency.

Aqua Regia

Aqua Regia is a fuming red or yellow mixture of acids that is formed by mixing freshly concentrated nitric acid and hydrochloric acid in the ratio 1:3. It means 'royal water,' because it can dissolve the 'royal' metals gold ,platinum, and other precious metals.

What are the uses of gold other than for jewellery?



Gold Plated Desktop Stirling Engine

Of all the minerals mined from the Earth, none is more useful than gold. Gold is highly valued, and is in very limited supply. It has long been used as a medium of exchange or money. The first known use of gold in transactions dates back over 6000 years.

The most important industrial use of gold is in the manufacture of electronics. Gold is a highly efficient conductor that can carry tiny currents, and remain free of corrosion. Electronic components made with gold are highly reliable. Gold is used in connectors, switch and relay contacts, soldered joints, connecting wires, and connection strips. A small amount of gold is used in almost every sophisticated electronic device, including cell phones, calculators, personal digital assistants, and other small electronic devices. Most large electronic appliances such as television sets, and computers also contain gold.

Gold is used in hundreds of ways in every space vehicle. In addition, many parts of every space vehicle are fitted with gold-coated polyester film. This film reflects infrared radiation, and helps stabilize the temperature of the spacecraft. Gold is also used in nanotechnology, dentistry, medicine- and of course, jewellery!

Gold Dust

Why is gold important in medicine?

The use of gold in medicine and dentistry dates back thousands of years. The earliest recorded medical use of gold was by the Chinese in 2500 BC. Since then, numerous cultures have utilized gold-based medicinal preparations for the treatment of various conditions, including small pox, skin ulcers, and measles.

In the 20th century, medicines containing gold were marketed for the treatment of rheumatoid arthritis, with the most widely used being the oral drug Auranofin. Gold offers a high degree of resistance to bacteria. So, it is the material of choice for implants in the inner ear, where the risk of infection is great. Gold compounds are used in the treatment of cancer. Doctors also implant high purity gold in the upper eyelid to treat facial nerve paralysis.

This gold tablet will give you relief.

STAR FACT

Production of Gold in India

India produces only a minute portion of the gold it needs. In fact only 0.5% of the gold that is consumed in India is produced in India. The rest is imported.

How do we check the purity of gold?

The karat- also written as 'K'- is a measure of the purity of gold. 24 K gold is the purest gold that you can get. If you are buying gold coins, make sure they originate from a mint. Smaller items such as rings and other gold jewellery should have an assay mark, or hallmark to show the purity of the gold. Gold bars and ingots should originate from a foundry.

While 24 carat gold is pure gold, or 99.9 per cent gold with some possible impurities, 18-carat gold is 75 per cent gold and so on. You can test the purity of gold yourself with the right test equipment. Mostly this consists of acids, which you can purchase for the purpose, although electronic testing is now becoming popular. However, electronic testers are expensive, and any chemical testing will cause a loss of some small amount of gold.

Kolar Gold Field Club

Where are the Kolar Gold Fields?

The Kolar Gold Fields, about 22 kms, east of Bangalore, produced a sizeable amount of gold during the days of the British Raj. Started by John Taylor & Sons in 1880, the mines were handed over to the government of India in 1972. They are believed to be the second deepest gold mines in the world.

The Kolar Gold Fields operated for over 120 years, and produced approximately 25 million ounces of gold. They have a maximum depth of 3200 metres, and 1400 km of tunnels, as well as 100 shafts. The mine became uneconomical in the late 1990's due to poor management, underinvestment, and the focus on labour-intensive deep underground mining. This led to the abandonment of mining operations in January 2002.

What is BIS certification?

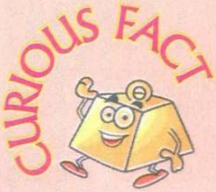
मानकः पथप्रदर्शकः

BIS Corporate Logo

The letters BIS stand for Bureau of Indian Standards. BIS certification is a voluntary scheme that is responsible for ensuring the quality of products. Its purpose is to provide third party guarantee of quality, safety, and reliability of products to the ultimate customer. In the case of gold, BIS certification is in the form of the hallmark symbol.

Hallmark is a purity certification of gold articles in accordance with Indian Standard. Gold articles are evaluated and tested at an official assaying and hallmarking centre, and then certified that the metal used conforms to the national and international standard of fineness and purity. Hallmark consists of five components. They are the BIS Mark, the fineness number, corresponding to given caratage, the Assaying and Hallmarking Centre's mark, the jeweller's mark and year of marking denoted by a code letter. So, when you buy jewellery always look for the BIS hallmark to be sure of the purity of the gold.

Gold Jewellery



Golden Treasure

The world's oceans are believed to hold up to 15,000 tonnes of gold. The only problem is that it is in a very dilute solution- just 10 parts gold per quadrillion!

Which are some of the most famous gold treasures?

There are many accounts of lost treasures. Between 1492 and 1600, more than 225,000 kg of gold was plundered by Spanish armies from the Inca Empire in Peru. In 1978, more than 20,000 gold objects thought to be looted from Silk Road traders by bandits of ancient Bactria, were found by Soviet archeologists. In Bulgaria, about 600 pieces of ancient ornaments were discovered in 1972. This is known as the Varna Necropolis Treasure.

In Egypt, Tutankhamen's treasure was discovered in his tomb in 1922. The king's coffin is made of solid gold. Other incredible objects found in the tomb include the golden mask of the king, and his throne. Tillia Tepe is an archaeological site in Afghanistan where a fabulous treasure consisting of about 20,000 gold ornaments, including coins, belts, medallions, and crowns was found. The list goes on, and who knows how many treasure troves remain to be found?

Golden Objects Found in the Necropolis Treasure

STAR FACT

Fort Knox

Fort Knox is a fortified vault building that houses a large portion of the official gold reserves of the United States. It holds roughly 3 per cent of all the gold ever refined throughout human history-around 4,578 metric tonnes!

● *Radha Nair*

Why is silver historically important?

Silver, the whitest of all metals, was one of the first metals to be discovered by Man. Its chemical symbol Ag is the short form of the Latin word 'argentum' which means white and shining. Silver is found in its natural state, and has been used since 4000 BC. In ancient Greece and Rome, silver was used as a medicine.

The currency of Ancient Rome was based on silver. The Chinese used silver as a medium of exchange. In short, silver has been a part of our society since the dawn of history.

World Gold Council

The World Gold Council is a nonprofit organization of 23 of the world's leading gold mining companies. It was established in 1987 to promote the use of gold. It provides informed opinions and advice to stakeholders and decision makers in governments and across the investment, jewellery and technology sectors. The 23 members represent 60 per cent of global corporate gold production.

Hey! These may be silver coins!

Properties of Silver

Silver is an excellent conductor of both heat and electricity. Silver metal in its pure state has a brilliant white metallic lustre. It is a little harder than gold, and is very ductile and malleable.

How do we extract silver?

Today, most of the silver produced is obtained as a by-product of the extraction and purification of copper, nickel, and lead. It was first extracted from ores soon after the opening of the Mexican silver mines by the Spaniards early in the 6th century. However, the methods used were quite uneconomical. Today, silver is commonly extracted from ore by smelting or chemical leaching.

Silver is also produced during the electrolytic refining of copper, and by application of a special technology on lead metal obtained from lead ores that contain small amounts of silver. Ores containing the silver mineral argentite- or silver sulphide- are also mined for the extraction of silver.

A Nugget of Silver

Silver Drachma from the Island of Aegina

What do we know about silver currency?

The Lydians were the first to use silver as money around 700 BC. The first currency of the modern Greek state, issued in 1828, was called the Phoenix. In Germany, in the late 15th century one finds silver coins called talers being used. Silver was also used by James VI of Scotland, who struck a 30-shilling coin between 1567 and 1571. Charles II of England struck the double merk of 1578, and this was called the thistle dollar. Spain too has issued crown size silver coins. Many of these early examples of silver coins can still be found in museums.

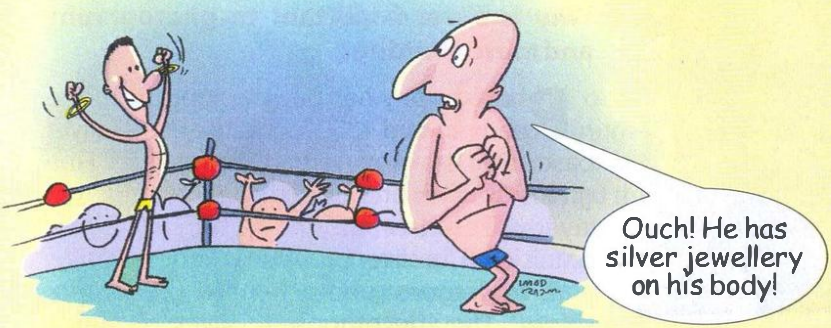
Athenian's Silver Coin

STAR FACT

Tarnished Silver

Silver reacts with sulphur pollutants in the air, to form a thin layer of silver sulphide. This gives a tarnished look to the silver, which can be removed with a metal polish. It can be prevented by thinly electro-plating the silver with rhodium.

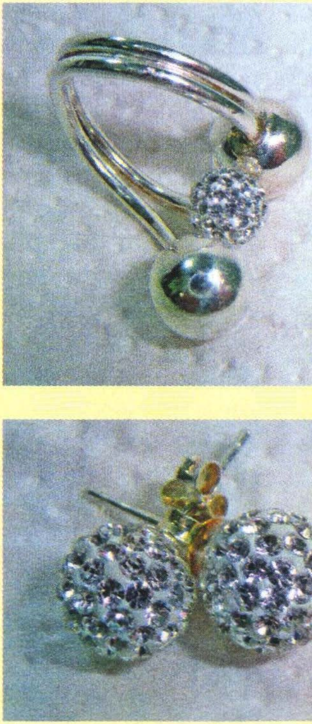
No gold! I want a Silver Coin.


Ouch! He has silver jewellery on his body!

Why is silver jewellery so popular?

Since the dawn of civilization people used silver because of its unusual strengths, and today you will find everyone from celebrities to teenagers to grandmothers wearing silver jewellery. One of the reasons for this is that silver has a trendy look. Moreover, many precious stones look better in a setting of silver.

Silver is sturdy by itself so there is no need to add any other metal to make it impure. This strength makes silver durable and suitable for everyday wear. Moreover, silver looks a lot like white gold so you can use silver like white gold, and it is a lot cheaper. Silver looks great on everyone, whether fair or dark, male or female. It is said to have many health benefits too, based on the belief that the metal stimulates the flow of energy and that by wearing silver jewellery, a person can accumulate more energy and become more focused.



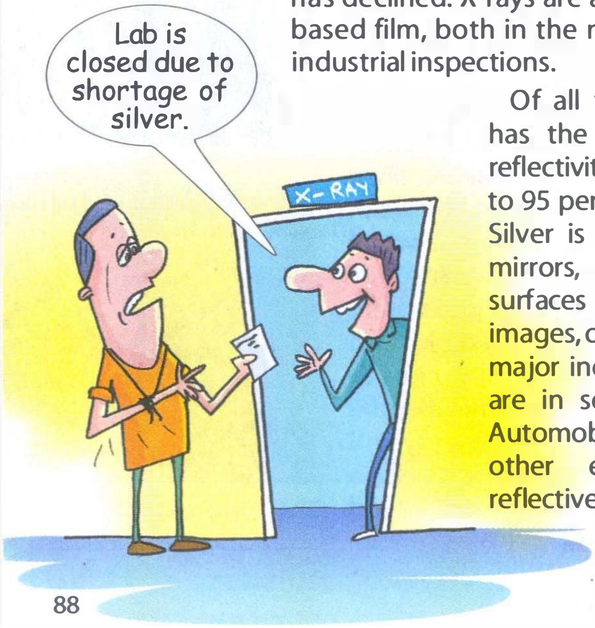
Silver Jewellery

A Photographic Film

Why is silver important to photography and mirror making?

Photography has been around since the early to mid 1800's, and the use of silver based film has grown steadily over years. Fine grains of silver bromide, suspended in a thin layer of gelatin forms a photographic emulsion. The silver bromide is light sensitive, and undergoes photochemical decomposition. The decomposed silver bromide registers an image. Further treatment causes the sensitized grains to be reduced to metallic silver. The undeveloped grains of silver bromide are removed by a fixing solution. The negative can then be washed, leaving the silver image. However, with the increased use of digital cameras, the use of silver based film has declined. X-rays are another use of silver based film, both in the medical field, and in industrial inspections.

Of all the elements, silver has the highest degree of reflectivity, and can reflect up to 95 per cent of visible light. Silver is used extensively in mirrors, and on all types of surfaces for either reflecting images, or moderating light. A major industrial use of silver are in solar pane windows. Automobile windshields are other examples of this reflective use.


Lab is closed due to shortage of silver.
X-RAY

Which metals make up platinum group of metals?

American Platinum Eagle

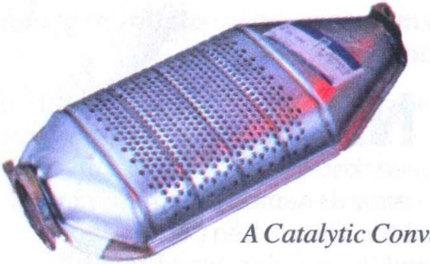
Naturally occurring platinum and platinum-rich alloys have been known for a long time. The Spaniards named the metal 'platina', or little silver, when they first encountered it in Colombia. The platinum group metals are rhodium, ruthenium, palladium, osmium, iridum, and platinum. Of these, platinum is the most important. These metals are very similar in many ways, and are extremely rare.

On average, there is only a gramme of ruthenium in each tonne of rock and barely a gramme of rhodium in over a 1000 tonnes of rock! Platinum's wear and tarnish resistance characteristics are well suited for making fine jewellery. Other distinctive properties include resistance to chemical attack, excellent high-temperature characteristics, and stable electrical properties. These metals are uniquely durable, and can be used extremely efficiently – meaning that a very little goes a very long way. When recycled, over 96 per cent can be recovered.

STAR FACT

Silver Soldering

Silver is used for soldering in the form of an alloy that is 30 per cent copper and 10 per cent zinc. It has a high melting point, and is extremely strong. These advantages make it ideal for the engineering and jewellery industries.



A Catalytic Converter

What are the uses of the platinum group of metals?

The platinum group of metals- or PGMs- plays an important role in our everyday life, for they are used in so many things from fountain pens to aircraft turbines. In fact, one in four of the goods manufactured today either contain one or the other of these metals. The catalytic converter – a pollution control device- is the largest application of platinum group metals.

Platinum, palladium, and rhodium act as catalysts in the exhaust systems of automobiles. PGMs are used in the manufacture of nitric acid, and in the pharmaceutical industry. Platinum acts as a catalyst in fuel cells, and platinum jewellery is very popular now. Manufacturers have also begun to produce palladium jewellery recently.

CURIOUS FACT

Silver Dentistry

Silver is used widely in dentistry for dental fillings. Powdered silver and other metals are mixed with mercury to make a stiff paste that is used to fill a cavity. The mixture sets quickly.

I want platinum...

How are platinum group metals extracted?

Platinum is rarely found on its own, but is in combination with other base and precious metals. Extraction of the pure metal from ores includes milling the ore, a froth floatation process, and smelting at high temperatures. This removes base metals. This is further processed by electrolysis to remove nickel, copper, and cobalt. The high grade concentrate is treated by solvent extraction, distilling, and ion exchange treatment to separate the PGMs (platinum group metals) into its separate metals.

Which are the most abundant platinum group metals?

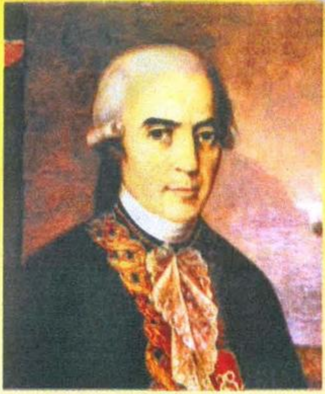
Platinum and palladium are the most abundant metals of this group. Platinum was discovered around 1550 by Spaniards working at the South American silver mines. The first written account of platinum was from Julius C. Scaliger in 1557. In 1783 French chemist Francois Chabaneaus discovered a method of producing workable platinum. English chemist William H. Wollaston developed a commercial process for producing pure platinum in the 19th century. He also discovered the metals rhodium and palladium.

One year later, two more of the platinum metals were discovered, naming them osmium from the Greek word meaning a smell, and iridium from iris, the Greek word for rainbow. In 1845, Klaus discovered ruthenium.

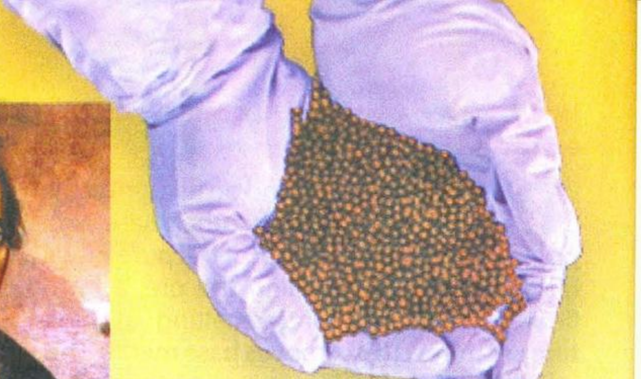
William H Wollaston

Julius C. Scaliger

I am trying to create platinum from gold.



Antonio de Ulloa-Credited with Discovery of Platinum



Palladium Based Sorbents

What are the properties of the platinum group of metals?

Platinum, iridium, and osmium are the densest known metals. Platinum is 11 per cent denser than gold. Palladium, rhodium, and ruthenium are lighter. Platinum and palladium are soft, ductile, and resistant to oxidation. Rhodium and iridium are valuable alone, as well as in alloys. Ruthenium and osmium are hard, brittle, and almost unworkable in the metallic state, with poor oxidation resistance.

PGMs are often used as catalysts, because of their chemical stability. Palladium and platinum are used in the petroleum industry. Iridium and platinum are used in pacemakers. Osmium is used as a stain for fingerprints and DNA. Rhodium is used in the production of nitric acid, while ruthenium is used in chemicals.

STAR FACT

Platinum in the Kitchen

Platinum is used in ignition devices for domestic gas stoves. It is also used in the manufacture of margarine. So, platinum has a role to play in your kitchen too!

● *Dev Nath*

Gold in Films and Books

Many films were inspired by gold and the Gold Rush . The most famous of them must be the movie Mackenna's Gold, directed by J. Lee Thompson. The film is based on the novel of the same name by Heck Allen telling the story of how the lure of gold corrupts a diverse group of people. 'The Gold Rush' is another famous movie. It is a silent comedy film starring Charlie Chaplin, based on the Klondike Gold rush. Similarly, many works of Jack London, the great American story writer, were inspired by the Klondike gold rush. In 1974, a thriller film 'Gold' was released, whose story was adapted from the novel 'Gold Mine' by Wilbur Smith.

What do we know about ruthenium and osmium?

The Russian chemist Karl Klaus is credited with the discovery of ruthenium in 1844. Ruthenium is a very rare, hard, lustrous, brittle, silvery-white metal that does not tarnish at room temperature. The metal is unaffected by air, water, and acids. It reacts with molten alkali and halogens, and can oxidize explosively. Small amounts of ruthenium are used to harden platinum and palladium, and it can also be alloyed with these metals to make electrical contacts. Interestingly, ruthenium is used in some Parker pen nibs.

Osmium was discovered in 1803, in London, by English chemist Smithson Tennant. It is a rare, lustrous, very hard, brittle, bluish-white metal that is the densest of all the elements. Osmium is principally used alloyed with other metals in the platinum group to produce very hard alloys. An alloy of 90 per cent platinum and 10 per cent osmium is used in surgical implants such as pacemakers and replacement heart valves. Powdered osmium in air forms the pungent, highly toxic osmium tetroxide, which can cause lung, skin and eye damage.

Osmium

What are the main uses of ruthenium and osmium?

Ruthenium is widely used in electrical components called resistors. Hard disc drives store information on discs that are coated with a magnetic material. The amount of information that can be stored can be increased enormously by adding a layer of ruthenium just three atoms thick. The oil industry uses ruthenium and its compounds as catalysts.

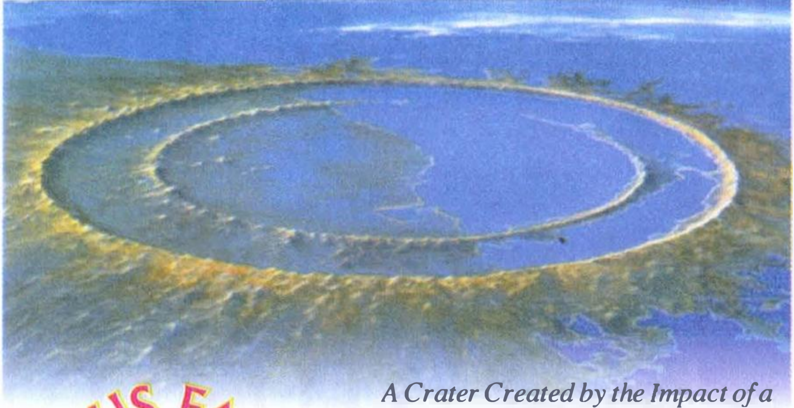
Osmium is used in alloys with other platinum group metals and gold, because it makes them much harder. These alloys are used to make tough pen nibs and parts for scientific instruments. Osmium is also used to stain specimens that have to be examined under a microscope.

Who discovered rhodium and iridium?

Rhodium was discovered by William Hyde Wollaston, an English chemist, in 1803 shortly after his discovery of the element palladium. He obtained rhodium from a sample of platinum ore that was obtained from South America. One of the rhodium compounds Wollaston made was red, so he named the new metal after the Greek word for rose-coloured.

Smithson Tennant is credited with the discovery of iridium while examining platinum ore in 1804. However, crude indium metal was not extracted for another 10 years. As iridium makes colourful compounds, it is named after Iris, the ancient Greek goddess of rainbows.

Rhodium



A Crater Created by the Impact of a Meteorite

Why is it believed that iridium may be responsible for the extinction of dinosaurs?

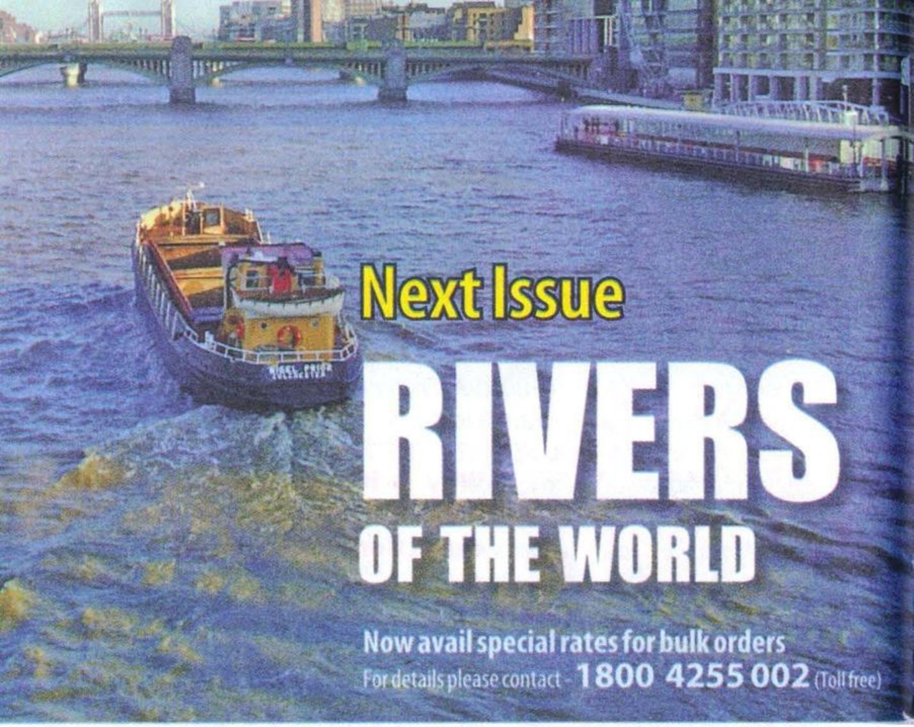
Iridium is a stable metal that is chemically un-reactive. It is the most resistant to oxidation of all metals. However, it is very difficult to work with, as it is very hard and brittle.

The metal iridium is very rare on Earth's surface, but is more common in asteroids and meteorites. Meteorites release a lot of iridium when they crash through the atmosphere, and hit the ground. Scientists believe that a meteorite impact occurred 65 million years ago. The impact would have thrown up lots of dust into the atmosphere, affecting the climate, and helping to drive the dinosaurs to extinction. They have evidence to support this theory in the form of levels of iridium 30.

Uses of Rhodium

Rhodium is used to make electrical contacts, as jewellery and in catalytic converters, but is most frequently used as an alloying agent in other materials, such as platinum and palladium. These alloys are used to make such things as furnace coils, electrodes for spark plugs, and laboratory crucibles.

● *Sneha Rao*



Next Issue

RIVERS OF THE WORLD

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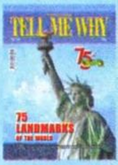
They use a shiny metal for ornaments...

What do we know about platinum and palladium?

The people living in Central America were using platinum for jewellery long before Christopher Columbus discovered America. Platinum is a silver-grey, shiny metal that is both malleable and ductile. It has a melting point of about 1,773°C, and a boiling point of about 3,827°C. Platinum is a relatively inactive metal. Palladium is quite rare. It also has a beautiful shiny finish that does not tarnish easily. It is both malleable and ductile.

Clarifications & Corrections

It is our policy to correct errors, and present differing views and clarifications about the contents in previous issues. Please send in your feedback, mentioning the title and page number.



Rudresh Senapati, a student of class 9, Buxi Jagabandhu English Medium School, Bhubaneswar, Orissa adds a point to the answer given for the question 'What is the importance of Suez Canal?' (Page 45 of our December issue).

The answer given was that 'the Suez Canal is a man-made waterway that connects the Mediterranean Sea and the Indian Ocean'. Rudresh points out that the Suez Canal actually connects the Mediterranean Sea to the Red Sea. Red sea is an inlet of the Indian Ocean.

Thank you Rudresh for your valuable feedback.

- Editor

Platinum Coins

What are the uses of platinum and palladium?

Platinum is used for making catalysts. Platinum catalysts are widely used to make compounds that end up as fertilizers, plastics, synthetic fibres, drugs, pharmaceuticals, and dozens of other everyday products. Platinum is also used in medical devices. Palladium too is used as a catalyst in breaking down petroleum to make high quality gasoline and other products, and in the production of some essential chemicals. Of course, both platinum and palladium are used for making fine jewellery as well.

I Wonder Why?

Question of the Month

Send us your questions
E mail:
childrensdivision@mmp.in

Why is an air cooler different from an air conditioner?

An air cooler is a system which cools the air by adding water to the air. Air from the cooler's fan passes through a rolling pad of moist cloth, thereby adding water vapour to the air. The evaporation of water absorbs some of the heat from the air, and this reduces the temperature inside the room.

On the other hand, an air conditioner is a system which controls and maintains the temperature level in a closed space. Air conditioners use a chemical that easily convert from gas to liquid and back again. This chemical is known as the refrigerant. This is used to transfer heat from the air inside to the outside air using a system consisting of two fans. Since it does not use water vapour, its efficiency is independent on the relative humidity. It condenses much of the moisture out of the interior air and thus reduces the indoor humidity.

● *Alwin George*

MANORAMA TELL ME WHY - GOLD AND OTHER PRECIOUS METALS

Editor: Ammu Mathew Editor-in-Charge: A.V. Harisanker *

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